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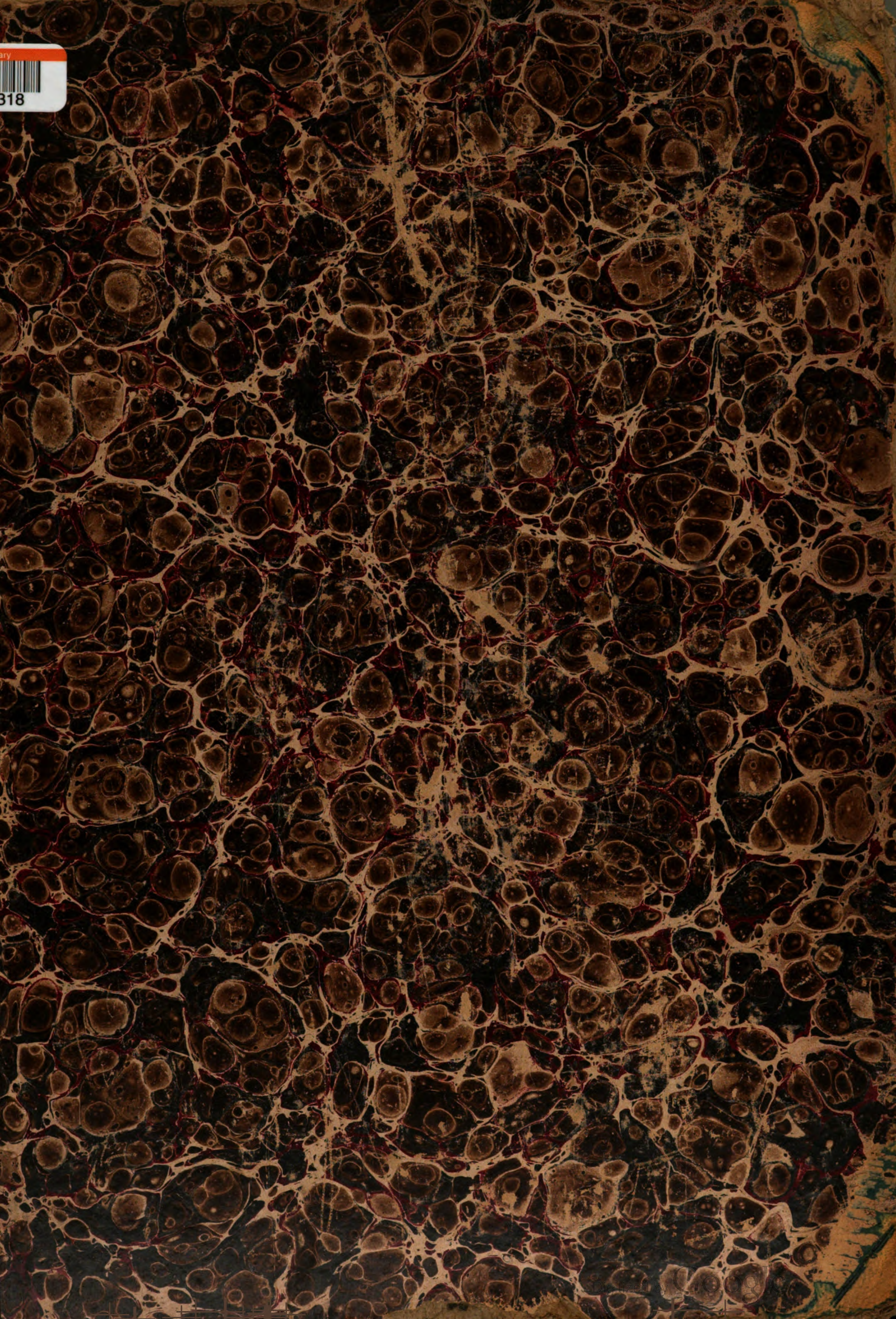
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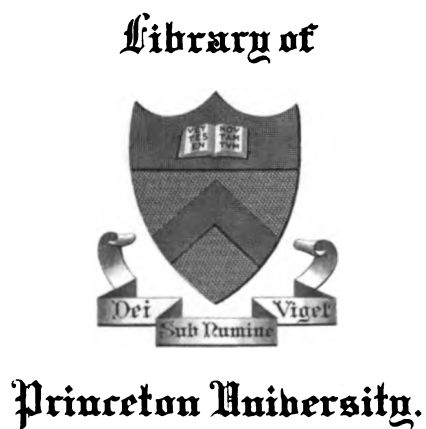
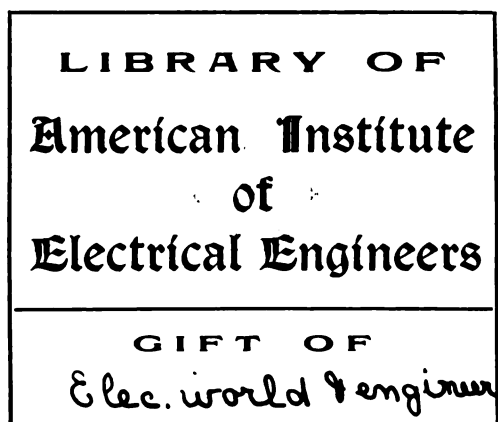
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## OCEAN TELEGRAPHY.

BY GEORGE B. PRESCOTT.

(From the Scientific American.)

### NUMBER I.

If the unexpected discoveries and gigantic works which have been realized during the past half century had not familiarized us with the marvelous, we should consider the accomplishment of ocean telegraphy to be the eighth wonder of the world: a wonder, on account of the almost supernatural results which it furnishes, the numerous difficulties which it has encountered, the physical results which it has produced: and even a wonder on account of the enormous amount of money which has been expended in its development. In discussing the extent of this marvelous system of international communications, it seems proper to consider to whom is due the credit of taking the first steps toward its accomplishment. Up to 1847, no substance suitable for the insulation of a submarine wire was known. During that year, Mr. John J. Craven obtained and experimented with some gutta percha, and discovered its insulating qualities and its adaptability to subaqueous communication. The Trenton, N. J., *State Gazette*, for May 10, 1848, contains the following paragraph: "Gutta percha is now used for insulating telegraphic wires. Mr. Craven has tried it for the old New York and Philadelphia line in the Passaic river, and has been so successful that the company intend to try to cross from Jersey city to New York by laying several wires, thus insulated, under the water." The New York *Tribune* of June 17, 1848, contains the following paragraph: "The wires of the New York and Philadelphia Telegraph have been extended across the Hudson from Jersey City, and are now in successful communication with that place. They are encased in a double covering of gutta percha, and laid on the bottom of the river in the track of the ferry boats."

In 1846, Mr. James Reynolds, of New York, invented a machine for covering wire with india rubber, and during the year 1847 covered a large amount of wire with this substance; but in consequence of the difficulty of drying it (vulcanization of rubber being then unknown), it proved a failure. Early in the Spring of 1848, Mr. Craven brought a piece of wire covered with gutta percha to Mr. Reynolds, and asked if he could cover wire with gutta percha with his machine. Mr. Reynolds undertook to do so, and immediately proceeded to manufacture gutta percha covered wire. He covered the cable which was laid across the Hudson river between New York and Jersey City, which was the first gutta percha cable ever made, and the first submarine wire ever constructed and successfully operated for the transmission of intelligence over a distance of half a mile.

One of Mr. Reynolds' workmen, named Champ-lin, shortly after this cable was laid, went to England and communicated the process to the Gutta Percha Company, who at once commenced the manufacture of gutta percha covered wire.

On the 16th of December, 1859, Mr. Charles Vincent Walker, an experienced telegraph engineer, testified before the joint committee, appointed by the British Government to inquire into the construction



Figure 1.

of submarine telegraph cables, as follows: "I was the first to use gutta percha in England. I advised Mr. Foster, of Streatham, to apply it in our very early difficulties in telegraphing. We purchased and used the first wire covered with gutta percha, on November 11, 1848."

The first submarine cable ever laid in the open sea was laid between Dover and Calais, in 1850. It was



Figure 2.

a single strand of gutta percha, unprotected by any outside coating, and worked only one day. The next cable was also laid between Dover and Calais, in 1851. This cable contained four conducting wires, was 27 miles in length, and weighed 6 tons per mile. This cable is still working, after having been down 23 years. The next long cable was

laid in 1853, between Dover and Ostend, a distance of 80 miles, and contained six conducting wires, and weighed 5½ tons per mile. It is still in working order. In 1858 a cable of one conducting wire was laid between England and Holland, 120 miles, weighing 1½ tons per mile. This cable worked for twelve years. From 1853 to 1858, 37 cables were laid down, having a total length of 3,700 miles; of which 16 are still working, 13 worked for periods varying from a week to five years, and the remaining 8 were total failures.

On the 6th of August, 1858, the first Atlantic cable was laid between Ireland and Newfoundland. The weight of this cable was 1 ton per mile, and its cost was as follows: Price of deep sea wire per mile, \$200; price of spun yarn and iron wire per mile, \$265; price of outside tar per mile, \$20. Total per mile, \$485. Price, as above, for 2,500 miles, \$1,212,500; price of 25 miles shore end at \$1,450 per mile, \$36,250. Total cost, \$1,248,750. This cable worked from August 10 to September 1, during which time 129 messages were sent from Valentia to Newfoundland, and 271 from Newfoundland to Valentia. The failure of the cable was mainly due to carelessness in the manufacture and subsequent handling. When the cable was in process of manufacture, it was coiled in four large vats, and left exposed day after day to the heat of a Summer sun. As might have been foreseen, the gutta percha was melted, and the conductor which it was desired to insulate was so twisted by the coils that it was left quite bare in numberless places, thus weakening and eventually, when the cable was submerged, destroying the insulation. The injury was partially discovered before the cable was taken out of the factory, and a length of about thirty miles was cut out and condemned. This, however, did not wholly remedy the difficulty, for the defective insulation became frequently and painfully apparent while the cable was being submerged. Still further evidence of its condition was offered when it came to be cut up for charms and trinkets.

The next long cable which was laid was from Suez to India, a distance of 3,500 miles, in 1859. This cable was laid in five sections, which worked from six to nine months each, but was never in working order from end to end.

The total length of all the cables which have been laid is about 70,000 miles, of which over 50,000 miles are now in successful operation. The 20,000 miles of cables which have thus far failed represents 58 in number. Up to 1865, none of them had been tested under water after manufacture, and every one of them was covered with a sheathing of light iron wire, weighing in the average only about 1,500 pounds per mile. These two peculiarities are sufficient to account for every failure which has occurred. No electrical test will show the presence of flaws in the insulating cover of a wire, unless water or some other conductor enters in the flaw and establishes an electrical connection between the out-



side and inside of the cable; and all cables laid in shallow water should have an armor weighing not less than five tons per mile.

The core of long submarine cables generally consists of several wires of pure copper covered with alternate layers of gutta percha and Chatterton's compound, the latter consisting of gutta percha, resin, and Stockholm tar. Over this is placed a layer of tarred yarn, and the whole is finally included in a sheathing of iron wire laid on spirally, to give the cable sufficient strength to withstand the

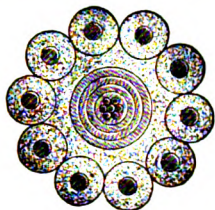


Figure 3.

strain of paying out, or that to which it may be subjected by the inequalities of the ocean bed. Not infrequently the iron wire of the sheathing is also protected from corrosion by tarred hemp. Figs. 1 and 2 show the construction of the Malta and Alexandria cable. The different layers are so far peeled off as to show the construction. The strand of seven copper wires is shown at the top; then follow three layers of gutta percha and one of tarred yarn, the whole enveloped in the eighteen wires constituting the sheathing. The diameter out in the sea is

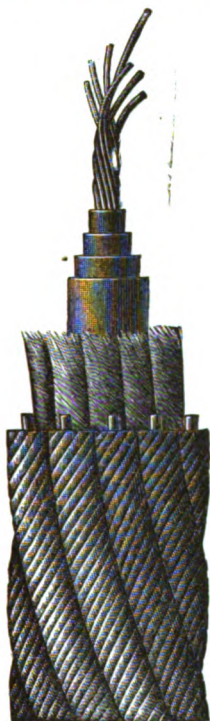


Figure 4.

0.85 of an inch. Near the shore the sheathing is made stronger, to meet the danger of accident from the dragging of anchors.

Including the original 1858 cable, five cables have been laid down between Ireland and Newfoundland, of which only three are now in working order. These three were laid in 1866, 1873 and 1874. The cable of 1865, of a similar type as the above, has not been working for over two years.

The following are the details of construction of the last four Ireland and Newfoundland cables: Fig. 3 shows the section and Fig. 4 the external appear-

ance and construction of the 1865 cable in the full size,  $1\frac{1}{2}$  inch in diameter. Fig. 5 shows the shore end in section. The construction of the 1865 cable is the same as that of all the subsequent ones, with one or two non-essential differences.

The conductor of this cable consists of a copper strand of seven wires, six laid round one, and weighing 300 pounds per nautical mile, imbedded, for solidity, in Chatterton's compound. Gage of single wire, 0.048 of an inch; gage of strand, 0.144.

The insulation of each cable consists of four layers of gutta percha, laid on alternately with four thin layers of Chatterton's compound. The diameter of core (conductor and insulation) is 0.464 of an inch.

Its external protection consists of ten steel wires, 0.095 of an inch in diameter, each wire surrounded separately with five strands of tarred manilla hemp, and the whole laid spirally round the core, which latter is padded with tarred jute yarn. The weight in air is 35 cwt. 3 qrs. per nautical mile; weight in water, 14 cwt. per nautical mile. Any of the cables would bear eleven knots of itself in water without breaking.

When a telegraph wire at a distant station is disconnected from the ground and placed in con-

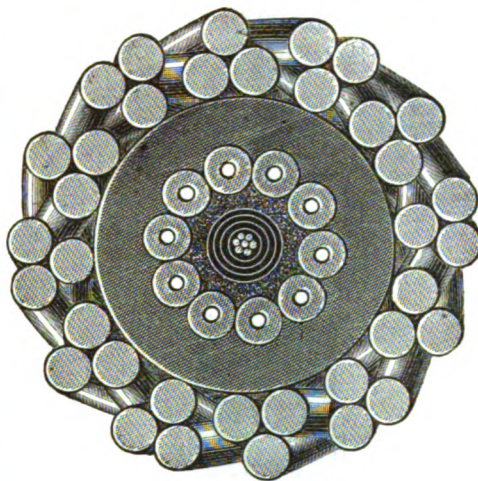


Figure 5.

nection with one of the poles of a battery, the other pole of which is to earth, a charge flows into the wire at the instant in which the connection is made and, if the insulation of the line is perfect, almost instantly ceases. The needle of the galvanometer makes a sudden deflection, and then returns to its position of rest. If the battery is cut off and the line, at the same moment, put to earth, the needle deflects momentarily in the opposite way, and the charge given to the wire returns and goes to earth. In land lines, this return charge is very slight except upon very long lines, but in submarine cables it is very marked. This return charge shows that a telegraph wire may be charged like a Leyden jar. The wire is the inner coating, the air or gutta percha the dielectric, and the earth or sea the outer coating. The statical charge of which a line of telegraph is then capable shows that the electric force tends to propagate itself not only longitudinally but laterally. The effect of lateral induction is to retard the time of delivery of a signal and to prolong it, so that, although it is a momentary signal at starting, it becomes a prolonged signal at its destination. The mere slowing of the signal would not matter much, provided it was delivered at its destination as sent; but it is not. Each signal at the receiving station takes a longer time to leave the line than it

did to enter it. Hence, in a cable, if the sender transmitted at the same rate and with the same apparatus that he does in land lines, the signals would run into each other at the receiving station, and be indistinguishable. Time must be given to allow each signal to ooze out of the cable before another is sent. Retardation increases with the square of the length of the line. The maximum speed of signaling through 2,000 miles of the Atlantic telegraph of 1858 was two and a half words a minute. The copper core had a conducting power somewhat higher than a No. 4 iron wire. If the ratio of the thickness of the core to that of the insulating coating be kept the same, the number of words that can be sent varies as the amount of material employed, or as the square of the diameter of the cable. Thus, if a cable be of the same make and of equal length as another, but twice as thick, four times as many words may be sent by it.

The conductor of the Atlantic cable of 1858 consisted of a strand of seven copper wires of No. 22½ gage, weighing 93 pounds per mile, while those of 1865, 1866, 1873, and 1874 have each 300 pounds per mile. The highest rate of speed obtained through the 1858 cable was 2½ words per minute, while through the 1865, 1866, 1873, and 1874 cables they have obtained a speed of 17 words per minute in regular working, and of 24 words per minute upon an experimental test.

**SPECTRA OF LIGHTNING—Th. Hoh.**—I never saw the spectral phenomena produced by lightning, first described by H. Kundt (*Pogg. Ann.*, Bd. cxxv., p. 325), so beautifully and distinctly as in a violent storm which passed over Bamberg, April 23rd, between 5 and 6 P.M., in a direction from W.N.W to S.E. My apparatus was a small "direct vision" spectroscope, of 9 c.m. in length (without telescope), the slit of which was open about  $\frac{1}{4}$  m.m. Turning to the quarter of the heavens where the lightning was to be expected, I saw first the spectrum dark, but still distinct in its colors, with the strongest Fraunhofer lines. Three or four times there appeared in the yellow and green a diffused, but recognisable illumination, followed each time by thunder within ten to fifteen seconds, and probably due to sheet lightning. Afterwards I observed ten times the spectrum of lightning. In three cases the phenomenon consisted merely of a bright illumination and expansion of the green zone over a part of the blue. In two there was a well-defined appearance of the yellow sodium line, and a fainter one in the red. In the other five cases there were distinct and brilliant lightning spectra, of linear form and rare beauty. Before the splendor of the fine lines the local colors certainly vanished, but their position could be distinctly perceived. I believe that I always counted two to three lines in the red, one each in the yellow and the orange, three or four in the green, sometimes one in the violet. An intense flash, about 20 minutes before 6, which set fire to the town, showed, in addition to the above, a group of five lines in the blue.

**THE CORRELATION OF FORCES.**—Of the various forms of energy existing in Nature, any one may be transformed into any other, the one form appearing as the other disappears. This is what is meant by "the correlation of forces." Thus the rotary power of a wheel, if applied to turn a magnet, is converted into electricity; and this electricity, if employed to drive a wheel, is changed back into rotary power.



## THE PRUSSIAN TELEGRAPH SYSTEM.

On the occasion of the twenty-fifth anniversary of the Prussian telegraph system, which was first thrown open to the public on the 1st of October, 1849, the Director of Prussian Telegraphs, Major-General Meydam, has published a short historical review on this subject, from which we take the following data:

A line of optical telegraphy was established so early as 1832, between Berlin, Magdeburg, Paderborn, Cologne, Coblenz and Treves, which was worked under the supervision of the Ministry of War, and was conducted by Major (later General) von Etzel as director. Its organization was military, and it served only for the transmission of political and military news. On its extension and changed destination the Minister of War had mooted its separation from his department. The director of the optical telegraph left the service in 1848, and was succeeded by his son, Major of the General Staff (now General of Infantry), von Etzel, and his successor, in 1849, was Colonel du Vignau. The latter was, at the same time, appointed Chairman of the Telegraph Commission, which acted under the Ministry for Commerce, Trade and Public Works, and eventually resulted in the Royal Telegraph Direction. This was formally instituted an independent department by royal order of 23d of May, 1849. The optical line of telegraph between Berlin and Cologne was abolished as obsolete, the electric telegraph was introduced in its place, and the suitable military officials became civil employés.

On the 4th of December, 1851, Major of Engineers Chauvin was appointed Director of the Telegraph Department. Unfortunately, in the following years the introduced subterranean telegraph lines failed so often that it was found necessary, if telegraph communication was to be kept up, to make them all overground ones. After an experimental introduction in the autumn of 1851 of an overground line of telegraph, the change of the existing underground lines into overground ones, in which galvanized iron wire, isolated by porcelain bells, was carried on poles, was taken in hand in 1852. At first Berlin was connected only with the principal cities and such towns as possessed exchanges of the provinces and neighboring States, regard being had to the requirements of each Government, so that but few stations were opened, only ninety-seven at the end of 1857. Although it was soon evident that the existing lines were insufficient for the requirements of the public, it was not until after 1858 that a serious attempt was made to extend the lines, so as to cover the country with a complete network. Originally the chief telegraph lines started from the Berlin termini of the respective railways, but in 1850 part of the building in which the General Post-Office at Berlin was located was fitted up as a central telegraph station; and when these premises became too narrow for the extended business, a separate building was constructed, in which the Central Telegraph Station, and the Telegraph Administration have had their domicile since 1864.

The tariff was in the first years of telegraphic communication regulated by a graduating scale, and was pretty high. The lowest charge was 2s. for a telegram of twenty words; one from Berlin to Hamburg cost then 6s., which sum will now cover the charge for a telegram from England to almost any country in Europe. A telegram from Memel, at the eastern extremity of the Prussian monarchy, to Aix-la-Chapelle, at the western, cost then 12s. With the year 1858, however, a change for the better took place, the rates uniformly lowered, the above-

mentioned charges being reduced to 1s. 2½d., 8s., 7s., and 7s. 2½d. respectively.

Of great service, as we all know, has been the telegraph to Prussia during the wars of the last ten years. Under the co-operation of the Telegraph Administration, the Prussian Ministry of War had organized a movable field telegraph for the use of the army in the field along with an efficient corps.

Always careful with regard to its army, the Prussian Government laid the foundation of its army telegraph corps during peace; materials for the construction of light field telegraph lines and temporary stations, as well as the carriages necessary for transport, were accumulated, to serve at once at the mobilization of the army in forming field telegraph sections. Two such sections were already in operation during the Danish war, and proved exceedingly useful. In the campaign of 1866, the army telegraph corps consisted of four sections: one for the general staff, and one each for the three separate armies (the Silesian, the Bohemian and the Main). In both wars the Director of Telegraphs, Colonel von Chauvin, was conducting the operations of the telegraph corps on the respective seats of war. By Article 48 of the North German Constitution, the Telegraph Administration was empowered in 1867 to take under its supervision all the telegraphy lines of the different States. The position of the Telegraph Department was still further confirmed by an order of the Federal Council of the 18th December, 1867, by virtue of which the Administration of the Postal and Telegraph system of the North German Confederation was divided into two branches, the "General Post-Office of the North German Confederation," and the "General Direction of Telegraphs of the North German Confederation," both divisions being subordinate to the Imperial Chancellor. The Director of Telegraphs, Colonel von Chauvin, was appointed Director-General of Telegraphs of the North German Confederation.

The organization of the existing telegraph administrations into a complete whole required extensive administrative and technical labor. The lowering of the rates from 10½d., 1s. 7½d., and 2s. 5d., to 6d., 1s., and 1s. 6d. respectively, into the three different zones into which the distances were divided, although it had the effect of increasing telegraphic correspondence, did not result in the expected surplus with which it was intended to cover the outlay for the extension of the lines of telegraph, and an increased number of stations. The expenditure for this object had therefore to be provided from other parts of the revenues.

The efficiency of the German telegraph was severely tried in the late Franco-German War. Seven field and five *etappe* telegraph sections were in operation, under the command of Colonel Meydam, (since the beginning of 1870 the representative of the Director-General), who during the war was attached to the general staff. Two Bavarian field telegraph sections, and one attached to the Württemberg contingent, co-operated with those of the North German Army.

After the definitive constitution of the German Empire, its telegraph system was organized as one department, and has since been so represented in its relations with other countries, though the Bavarian and Württemberg telegraph administrations still exist in their integrity.

The first Director-General of Telegraphs of the German Empire, Major von Chauvin, resigned in 1873 on account of his health, which had been shattered during a period of the most laborious exertions in his sphere, and his successor is Colonel, now Major-General Meydam (the author of the memoir of

which this is a *résumé*), formerly chief of the Department for Engineering in the Prussian Ministry of War, who had been Von Chauvin's representative since 1870.

## CHEAP TELEGRAPHY.

(From the Scientific American.)

President Orton's report of the affairs of the Western Union Telegraph Company is not calculated to inspire much hope in those who believe that the government can run the lines at cheaper rates to the public. On the 1st of January, 1873, a reduction of more than fifty per cent. was made in the maximum tariff between the most remote points on the company's lines. This, though occasioning a temporary loss of revenue, has resulted, during the last few months, in a large increase. The reduction was from \$7.50 and \$5 to \$2.50. President Orton now adds that, owing to Messrs. Edison's and Prescott's quadruplex apparatus, which is, at the present time, working successfully between Chicago and New York, and by which two messages are sent in the same direction and two more in the opposite direction simultaneously on a single wire, he believes it practicable before long to cut rates down still lower, and ultimately to establish but four rates for day messages, namely, twenty-five, fifty, seventy-five cents, and one dollar, with half charges (except for the lowest) for night messages.

## THE WESTERN UNION DENVER OFFICE.

No handsomer headquarters for the electric paraphernalia can be probably found for a thousand miles, and in any direction, than those recently occupied by the Western Union Telegraph, in this city. The office is now in the second story of Woodward's Block, on Holladay street, which has been fitted up for the purpose, with all the modern improvements. It possesses three improved tables, on each of which four instruments are mounted, affording an aggregate of twelve keys, on which to transmit and receive messages. Everything about the office in the way of furniture and fixtures is new, and it is lighted splendidly by three immense windows.

The enterprise of the Company in affording such a pretty place for Denverites to do their telegraphing in is only on a par with that which has all along induced it heretofore to plant telegraph stations in advance of settlements. All this western country has been particularly favored by this great corporation in this respect, and also in the care which it has taken to make the lines thus established durable, by using cedar poles in place of the wood ordinarily used for that purpose.

Mr. B. F. Woodward, as nearly everybody in Denver knows, is the manager for the Company here, and he is in command of a comparatively large and capable corps of operators.—*Rocky Mountain News*.

**AN EXPERIMENT WITH SILVER.**—Boetger offers the following experiment to show the formation of binocide of silver and metallic silver by electrolysis: A concentrated solution of nitrate of silver is placed in a wide glass cylinder, and two platinum wires, forming the poles of a galvanic battery, are placed in the solution in a vertical position, about three inches apart. Beneath the anode is placed a small watch glass, and the current from two Bunsen cells started. In a few minutes brilliant needles of binocide of silver appear on the anode, and, becoming too heavy to remain unsupported, fall on the watch glass beneath. On the cathode an equivalent quantity of pure metallic silver collects in snow-white dendritic ramifications.

## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

The solutions of the problem of the combined resistance of bridge circuits, furnished by Messrs. Hamilton and d'Inville, are correct as published in the JOURNAL. The London *Telegraphic Journal* also published the same solution of this problem. All of these are based on what are known as Kirchhoff's laws. The same result, however, may be attained in another manner quite independent of Kirchhoff's laws.

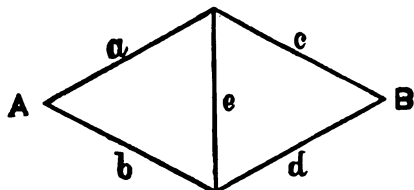


FIGURE 1.

There are three paths for the current from A to B, Fig. 1. 1st, through *a* and *c*; 2d, through *b*, *e* and *c*; 3d, through *b* and *d*. If these paths can be arranged so that each is independent of and separate from the others (as represented in Fig. 2), the question is reduced to the simple one of finding the combined resistance of three conductors.

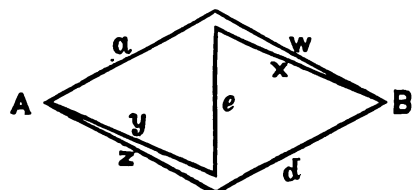


FIGURE 2.

Imagine the sections *b* and *c* (Fig. 1), each split longitudinally into two conductors, and one of each connected, as shown in Fig. 2, to the two ends of *e*. Call the two parts of *c*, *w* and *x*, and the two parts of *b*, *y* and *z*. The combined resistance of *w* and *x* must equal *c*, and that of *y* and *z* must equal *b*; from which the two following equations are obtained:

$$\frac{wx}{w+x} = c \quad (1)$$

$$\frac{yz}{y+z} = b \quad (2)$$

Again, the potential at the point of junction of *z* and *d* must be the same as at the junction of *y* and *e*. To effect this the resistance *y* must bear the same proportion to *z* as *e* + *x* to *d*. This gives:

$$\frac{y}{z} = \frac{e+x}{d} \quad (3)$$

In the same manner the potential at the junctions of *a* with *w* and *e* with *x* being equal:

$$\frac{a}{y+e} = \frac{w}{x} \quad (4)$$

From these equations the following value of the unknown quantities *w*, *x*, *y* and *z* is obtained:

$$w = 3,818\frac{1}{2}$$

$$x = 4,200$$

$$y = 2,300$$

$$z = 1,769\frac{1}{2}$$

By substituting these values in Fig. 2 it will be evident that the question is simply to determine the joint resistance of three circuits, i. e.:

$$a+w = 6,818\frac{1}{2}$$

$$y+e+x = 7,500$$

$$z+d = 5,769\frac{1}{2}$$

and the result is 2,205 $\frac{1}{4}$ ,

A. S. BROWN.

To the Editor of the Journal of the Telegraph:

I have a private telegraph line, 30 miles long, running to my central office at Worcester. The main wire is worked with 10 cups, carbon battery, and works well.

To work our register we use 3 cups vitriol battery, such as is usual for locals. With this we find this trouble. If we leave the register on, in one hour it will run the battery all out and will have no working power at all, so that if we leave it switched on, so that we can hear the call, it will not stay up one hour, and we are obliged to cut it off and trust to the relay for the call, and switch it on when we wish to run the register. We have procured entire change of battery, cups and all, and it still is the same.

Now, can you tell us what is the matter. I am of the opinion that, if we were using it quite constantly, it would keep up, for I have noticed that when I found it quite weak and commenced to use it it would gradually come up; but we cannot use it constantly, but must leave it connected and at rest until we wish to use it.

No telegraph operator I have consulted can account for it. Will you tell us? L. J. K.

Answer.—The current strength obtained with a battery of given surface is at its maximum when the plates are so divided that the internal resistance of the battery is equal to that of the circuit.

In accordance with the law, as above, the resistance of your register coils should equal that of the internal resistance of the local battery. This may be properly arranged, and yet the proportions be made to vary, producing the trouble you experience, from the following causes:

1st. The platina points on the relay armature may be too soft. This would cause a very rapid oxydization, which, when accumulated, would cause a resistance sufficient to destroy the magnetic power in the register magnet. On removing the local circuit for a while, the points would, by the vibrations of the relay armature, clear themselves, and, on making local contact again, work well until they became again oxydized.

This may be remedied by burnishing the points occasionally.

2d. A defect may exist in the coils of the register magnet by which a great part, or the entire wire surrounding the core, may be cut out by the jar of the register lever.

Three cells of No. 1 gravity battery, of about 1 $\frac{1}{2}$  ohms resistance per cell, would be more constant and work satisfactorily.

HOOSICK FALLS, N. Y., Dec. 16, 1874.

To the Editor of the Journal of the Telegraph:

Please answer the following question in your next issue, and oblige: A customer comes into my office and writes a letter to R—, who lives five miles from the telegraph office. Customer desires to have the message delivered by messenger, and writes in the body of message, "deliver by messenger—charges guaranteed," and deposits the amount of money with me that I think will defray the expenses of delivery. In counting the number of words, I count deliver by messenger—charges guaranteed, and charge for those words. My repeating office thinks that I should not do so. Am I right or wrong? Remember those extra five words were not in the address, but body of message.

P. McKEOWN, Manager.

Answer.—You were right in charging for the extra words. It would also have been right to have charged for them had they been in the address or in any other part of the message.

ST. JOHNSBURY, VT., Dec. 9, 1874.

To the Editor of the Journal of the Telegraph:

Please inform me through the JOURNAL how many words in the following message:

"Ship one car corn, Coaticooke, Province of Quebec."

I claim that "Province of Quebec" should be counted as two words, as it is given to designate a place; the word "of" being counted as one word, and "Province Quebec" one word. OPERATOR.

Answer.—You are incorrect. Province of Quebec are three words.

VICTORIA, B. C., Dec. 11, 1874.

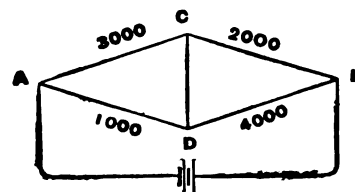
To the Editor of the Journal of the Telegraph:

Are there more than fifteen words in the following message: "What freight would be safe calculate; tendering for seven millions feet railroad ties, Cape of Good Hope. Reply?"

And has a repeating office, through which a message of this kind, checked "15 paid," passes, a right to alter the check to read 17 words? A. L. M.

Answer.—There are seventeen words. It is the duty of all offices, repeating or otherwise, to transmit and receive messages in a correct and proper manner. The number of words must correspond to the check.

MR. D'INFREVILLE offers the following problem for solution:



Resistance between A and B being equal to 2,100, required the resistance between C and D.

MEASUREMENT OF GALVANIC CURRENTS.—Mr. Latimer Clark states, in reference to a common source of error in the measurement of currents of short duration, that when using galvanometers with shunts, a certain discrepancy has been noticed, which is usually attributed to some peculiarity of the vibration of the needle of the galvanometer; and on endeavoring to ascertain the cause of this discrepancy, he discovered that the results given by the use of resistance coils were correct, and that those obtained by the use of condensers were wrong. The cause of the error he traces up to the fact that the movement of a magnetic needle tends to induce in the coil within which it is suspended a current in the opposite direction to that producing its deflection. A larger proportion of the whole current consequently passes by the shunt, which is not subject to the influence of the needle. If, therefore, two galvanometers are used, the movements of the needles within their coils being similar, each of them counteracts the other's influence, thus concealing the errors of the process. This source of error does not exist when the measure is made by a differential galvanometer. De Sauty's method of comparing measures is also free from this source of error, and, in general, he concludes that it is better in testing submarine cables to avoid the use of condensers for comparing batteries with standard cells, and to make use rather of very high resistance coils; and he has generally recommended the use of a resistance as high as 250,000 ohms.

In an ordinary open fire grate 75 per cent. of the heat resulting from the combustion of the fuel goes up chimney and is wasted, only 25 per cent. being radiated into the apartment.

W. W. W.—The matter will be promptly investigated. D. H. B.



## WESTERN AND BRAZILIAN TELEGRAPH.

The report states that the several sections of the Company's cables were completed as follows: Para to Pernambuco, 6th September, 1873; Pernambuco to Bahia, 11th December, 1873; Bahia to Rio de Janeiro, 24th December, 1873. These cables are all in thoroughly satisfactory working order. Owing to the unfortunate loss of the steamship *Gomos* in May last, and the lamentable wreck of the *Plata*, lately reported, communication has only been extended to Rio Grande do Sul southwards by the Platino-Braziliera Company. Arrangements are, however, in progress for the speedy completion of the short section still unlaid, which, when finished, will complete cable communication with the River Plate. The shareholders are aware of this Company's agreement with the Platino-Braziliera Company, by which all the cables between Rio de Janeiro and Montevideo, when laid, become our property. In connection with this agreement the Directors have to report that, pending the completion of the said cables, they have agreed to pay the Platino-Braziliera Company 5 per cent. of the gross earnings since the opening of their line from Rio de Janeiro to Rio Grande (that is, the 1st May last), in full of all claims of participation in traffic by the Platino-Braziliera Company. Upon completion of their line as above the agreement of the 23d of May, 1873, will come into force. The cables of the Central American Telegraph Company, between Para and Demerara, have been laid to Cayenne, and the necessary cable to complete the communication has left England. The extension of cable communication to the River Plate and the opening of the lines between North and South America will undoubtedly prove additional sources of revenue to this Company. Working agreements have been completed with the Brazilian Submarine Company, the West India and Panama Company, and the River Plate Company, by which all traffic passing over the lines of these companies for South America is secured to this Company. Although for some months only one section of the cable was laid and at work, and communication with Europe was not opened until the 22d June, 1874, from the opening of the line in September, 1873, to the 30th September last, the total amount of receipts was £70,473, of which £43,917 belong to this Company. From that date the receipts continue very satisfactory, being £23,298 up to the 4th inst.

## THE EASTERN TELEGRAPH COMPANIES.

The general meetings of the Anglo-Mediterranean, British Indian, and Falmouth, Gibraltar, and Malta Submarine Telegraph Companies, were held in London, on Thursday Dec 10th, when the final reports of the liquidators were presented and formally passed. The liquidators report that all the concessions, property and liabilities of these companies have now been transferred to the Eastern Telegraph Company, and that the affairs are fully wound up in accordance with the terms of the special resolution of the 3rd October and 1st November, 1872, upon the basis of which the Eastern Telegraph Company was formed, and these companies placed in liquidation.

The Chairman said the meetings were purely formal to confirm the amalgamation of the different companies, which have been united under the head of the Eastern Telegraph Company. He might state that these amalgamations were brought about at the instance of the different shareholders, and there was as yet no reason to regret what had been done. They now did all the work under one Board, and although the dividends had not been increased, nor

any immediate economy effected, still the arrangement was so far satisfactory.

A Shareholder asked why the liquidation of the Marseilles Company was still incomplete.

The Chairman said that the reasons arose from negotiations going on with the French Government in regard to a direct line through France. There had been considerable difficulty in bringing this about, but he was glad to say that only that morning the necessary assent had been received. The Marseilles report and accounts would now be submitted for passing in due course. The chairman concluded with a few observations on the national importance of submarine telegraphy.

A vote of thanks concluded the business.

**EASTERN TELEGRAPH.**—The Company announce that agreements have been completed with the French Government, her Majesty's Postmaster-General, and the Submarine Telegraph Company, by which they will be immediately placed in possession of a special wire between London and Marseilles, to be worked by the Company's own clerks. The new line is designed expressly for the traffic between Great Britain and Egypt, and the transit of messages will now be greatly accelerated.

In consequence of the loss of the *La Plata*, the cable steamer *Sydney Hall*, under charter by the Montevideo Brazilian Telegraph Company, to proceed to the River Plate to complete the communication in concert with the *La Plata*, is detained in the Thames until another steamer can be despatched by the Platino Braziliera Company.

THE Directors of the Anglo-American Telegraph Company have resolved to pay the usual interim dividend of 1½ per cent., free of income tax, for the quarter ending December 31st.

THE Directors of the Brazilian Submarine Telegraph Company have declared an interim dividend for the quarter ending September 30 last of 2s. 6d. per share, or 5 per cent. per annum, free of income tax, and payable on Thursday, December 24th.

THE Directors of the Eastern Extension, Australasia, and China Telegraph Company declared a dividend for the quarter ending September 30th of 8s. per share, or 6 per cent. per annum, free of income tax, payable on January 15th.

THE Eastern Telegraph Company announces that the usual interim dividend of 2s. 6d. per share, in respect of profits for the quarter ending 30th September last, will be paid on and after 14th January next.

THE traffic receipts of the Eastern Telegraph Company for November, 1874, amounted to £33,060, as against £35,096 for the corresponding period of 1873; and those of the Eastern Extension Telegraph Company for the same month amounted to £17,728, as against £17,454 for the corresponding period of 1873.

THE foundering of the steamer *La Plata* with a portion of the Brazilian cable on board will, it is stated, involve a total loss to the underwriters of £100,000. In the case of the *Gomos*, which was wrecked a short time since, the loss has, up to the present time, been only partially settled. The total liability will, it is reported, be about 35 per cent. of the whole sum insured.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending December 5th was 354,418, and during the week ending the 6th of December, 1873, 339,099, showing an increase in the week of 1874 on that of 1873 of 15,319.

## PROPOSED REFORM IN THE BRITISH PATENT LAWS.

We see it stated that the Lord Chancellor of England has intimated his willingness to receive a deputation on the Patent Laws, and to consider the bill in which the proposed reforms are embodied. The chief points are reduction in the cost of the Letters Patent, a simplification in the manner of obtaining them, and amendments in the legal proceedings for repression of infringement. A general reform of the Patent Office and of the arrangements of the Patent Museum will also be proposed.

**GALVANO-PLASTIC COPPERING OF CAST-IRON ROLLERS FOR CALICO PRINTING.**—*G. Schaffer.*—Many attempts have been made in this direction by Lockett (Lockett ?), L. Huguenin, and Schlumberger. One of the defects of the coppered rollers was that they were capable of losing their true form—an accident easily remedied upon a cylinder of copper, but not upon those of coppered iron. Th. Schlumberger cleanses the iron cylinders with a concentrated alkaline lye, washes well in water, and goes over the whole surface with the file. The surface is then very bright, and is not to be touched with the fingers or soiled with the breath. It is then plunged in an alkaline bath composed of—

Sulphate of copper.....	1 part.
Dissolved in water.....	12 parts.
Cyanide of potassium.....	8 parts.
Carbonate of soda.....	4 “
Sulphate of soda.....	2 “
Dissolved in water.....	16 “
Or, Ammonia.....	3 parts.
Acetate of copper.....	2 “
Dissolved in water.....	10 “
Cyanide of potassium.....	3 parts.
Carbonate of soda.....	4 “
Sulphate of soda.....	2 “
Dissolved in water.....	10 “

The cylinder is allowed to remain twenty-four hours in one of these baths, subject to the action of a battery of 4 or 6 pairs, till the surface is coated with a slender but adherent layer of copper. It is washed and cleansed with pumice-stone. If in this operation the iron should be laid bare in any part, the cylinder must be anew submitted to the alkaline bath. As soon as the coating of copper is uniform it is washed in acidulated water, and immersed in an acid bath of sulphate of copper. This bath is composed of solution of copper at 20° B., to which 1-300th of its volume of sulphuric acid is added to facilitate the solution of some metallic copper, which is also immersed in the bath for the purpose of maintaining the solution in an uniform state of concentration. Here the cylinder is left till the layer of copper has attained the desired thickness, a galvanic current being kept up by a battery of four pairs. If the temperature is between 15° and 18°, three to four weeks are required to produce a deposit of three-quarters of a millimetre in thickness. The cylinder is turned one-quarter round daily to change the portion of its surface which faces the sheet of copper used as a positive electrode.

**PYROMETERS.**—It appears from a report of a committee charged with examination of the above instruments, that, by means of the Siemens electric pyrometer, changes of resistance amounting to about 1000 of the quantity of heat to be measured can be detected without much difficulty.

The traffic receipts of the Western and Brazilian Telegraph Company, for the four weeks ended Nov. 20th, were £9,076.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
145 Broadway, New York, January 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Chehaw, Ala., re-opened, square 307.  
Notasulga, Ala., closed.  
Le Claire, Iowa, closed.  
The P. O. A. of York, Me., is York Corner.  
Hereafter the "tariff for other lines" to Morgan, Marquette Co., Mich., will be 150 and 10 from Chicago, Ill.  
Porter, Mich., changed to Stephenson.  
Hobart, Minn., changed to Frazee City.  
Hereafter the "tariff for other lines" to Sleepy Eye, Minn., will be 125 and 8 from Chicago, Ill.  
Fort Benton, Mon., closed.  
Lebanon, N. J., re-opened, square 53.  
Messages taken for Fairton, Cedarville, Dividing Creek, New port and Mauricetown, N. J., are delivered by train leaving Bridgeton, N. J., twice daily. Charges for delivery 25 cents.  
Athens, N. Y., closed.  
Assametsquagan, Que., closed.  
Allegheny Depot, Va., closed.  
Bloom, Wis., changed to North Freedom.  
Hereafter the "tariff for other lines" to Horicon, Reedville and Shiocton, Wis., will be 40 and 3, 60 and 4, and 70 and 5 respectively, from Chicago, Ill.

## NEW OFFICES.

\* Florence, Arizona., 100 8 San Diego, Cal.  
Cana Station, Cal.  
Greenville, "  
Taylorville, "  
506 Hall's Gulch, Col. P. O. Grant.  
\* Fort Lincoln, Dec., 300 13 307 Chicago, Ill.  
\* Stephenson, Mich., (formerly Porter), 100 7 307 "  
\* Black Hoof, Minn., 150 10 307 "  
\* Dakotah, Minn., 75 5 307 "  
\* Frazee City, Minn. (formerly Hobart), 150 10 307 "  
\* Minnetonka Mills, Minn., 125 8 307 "  
\* Swede Grove, Minn., 150 10 307 "  
\* Sandy Creek Junc., N. Y., 25 1 57 Utica  
180 Easton, O.  
\* Anderton, Ont.  
\* Charlemagne, Que.  
\* St. Flavie Station, Que.  
\* Eagle Ford, Texas, 25 2 511 Dallas.  
\* Belgium, Wis., 35 2 307 Chicago, Ill.  
\* Cato, " 60 4 307 "  
\* Grimms, " 40 3 307 "  
\* Knowlton, " 75 5 307 "  
\* Mosinee, " 75 5 307 "  
\* North Freedom, Wis. (formerly Bloom), 60 4 307 "  
\* Port Edwards, " 75 5 307 "  
\* Oostburg, " 35 2 307 "  
\* Sherman, " 35 2 307 "  
\* Wausau, " 75 5 307 "  
\* Weston, " 75 5 307 "  
\* Whitehall, " 100 7 307 "

The rate to square 574 from offices in the following States, is \$2.00:

Arkansas,	Kentucky,
Illinois,	Minnesota,
Indiana,	Missouri,
Iowa,	Tennessee,
Wisconsin.	

## TO OFFICES HAVING "SHEET C."

Offices in squares 307, 306, 307 and 316, which have "Sheet C," will make the following changes in their rates to the squares of the North Western Telegraph Company given below:  
From 297 to squares 23, 33, 40, 41 and 46, ONE DOLLAR.  
From 306 to squares 41, 46, 47 and 50, ONE DOLLAR.  
From 307 to squares 33 and 40, ONE DOLLAR.  
From 316 to square 41, ONE DOLLAR.  
These changes to take effect JANUARY 11th, 1875.

Add the following offices in Minnesota and Wisconsin to your Sheet C. and check accordingly.

50 Castle Rock, Minn.	41 Knapp,	Wis.
55 Cokato,	20 Lafayette,	"
38 Dakotah,	16 Lima,	"

41 Etter,	Minn.	29 Lowery's	Wis.
55 Howard Lake	"	38 Marshland,	"
38 La Moille,	"	15 Medina,	"
59 Nicollet,	"	24 North Freedom,	"
64 Swede Grove,	"	9 Oostburg,	"
56 Wells,	"	25 Port Edwards,	"
28 Arcadia,	Wis.	22 Remington,	"
32 Blair,	"	17 Richwood,	"
9 Belgium,	"	46 Roberts,	"
10 Fort Howard,	"	18 Royalton,	"
7 Grimms,	"	9 Sherman,	"
18 Junction City,	"	10 Shiocton,	"
29 Kendalls,	"	22 Whitehall,	"

St. Cloud, Minn., will hereafter be in square 55.

## ATLANTIC CABLE BUSINESS.

We are notified that the cable between England and Guernsey (Channel Islands) is broken. Messages for the Channel Islands are sent via France only. Tariff \$1.88 for twenty words or less, in addition to the ten-word rate to London.

The cable between Singapore and Batavia is repaired, and communication restored.

## CUBA CABLE BUSINESS.

The cable between Kingston and Aspinwall is again in working order.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE  
WESTERN UNION TELEGRAPH COMPANY,  
New York, Dec. 26th, 1874.

Executive Order No. 158.]

## GOVERNMENT MESSAGES.

Official messages of officers or agents of the United States will hereafter be transmitted, "paid" or "collect" at the option of the sender, priority being given them over all other business.

The tariff upon such messages will be 25 cents for 25 words or less, and one cent for each additional word for each circuit of two hundred and fifty miles or fractional part thereof.

All the words, except the date and the place where the message is filed, will be counted, and the distances will be computed by the tables of the Post-Office Department. If payment of a collect message is refused, delivery will be made nevertheless, and a report of non-collection immediately made by mail to the Auditor only. Credit will be taken for the uncollected tolls in the monthly account current, and a copy of the message returned as a voucher.

This order does not apply to such weather reports as are transmitted over scheduled signal circuits, the manner of returning which is specially provided for.

Executive orders Nos. 125 and 144 are hereby revoked.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
New York, Dec. 26th, 1874.

All franks issued by this Company during the year 1874, and now in force, are hereby extended until the 31st day of January, 1875.

GEO. H. MUMFORD,  
Vice-Pres't.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, Dec. 26th, 1874.

On and after January 1st, 1875, Greece City, Pa., Fagundus, Pa., and Shamburg, Pa., will be discontinued as money order offices.

GEO. H. MUMFORD,  
Vice-Pres't.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

RECEIPT OF ASSESSMENTS—NEW YORK, DEC. 24, 1874.

## ASSESSMENT No. 71.

23, 29, 31, 52, 54, 59, 60, 64, 67, 73, 75, 82, 83, 89, 95, 99, 103, 106  
114, 129, 140, 141, 142, 144, 148, 153, 159, 190, 191, 193, 197, 198, 230  
254, 269, 273, 279, 281, 283, 288, 285, 312, 342, 344, 346, 351, 353, 361  
367, 373, 378, 379, 391, 394, 405, 429, 430, 431, 466, 468, 469, 470, 471  
475, 514, 533, 542, 546, 554, 555, 560, 579, 586, 603, 661, 672, 678, 690  
685, 714, 739, 734, 740, 742, 750, 751, 753, 764, 769, 787, 791, 799, 812  
831, 855, 859, 873, 874, 875, 883, 886, 906, 917, 929, 932, 943, 952, 977  
978, 1023, 1038, 1040, 1047, 1072, 1088, 1090, 1093, 1102, 1143, 1147  
1169, 1198, 1200, 1226, 1237, 1238, 1239, 1267, 1288, 1325, 1339, 1364  
1365, 1398, 1407, 1417, 1426, 1444, 1449, 1451, 1454, 1455, 1456, 1482  
1484, 1488, 1489, 1498, 1505, 1506, 1507, 1508, 1517, 1522, 1532, 1554  
1555, 1569, 1582, 1589, 1601, 1615, 1620, 1625, 1634, 1652, 1656, 1658  
1676, 1681, 1682, 1697, 1699, 1707, 1721, 1723, 1732, 1733, 1736, 1745  
1775, 1791, 1809, 1810, 1811, 1812, 1847, 1869, 1906, 1919, 1938, 1942  
1967, 1965, 1991, 1999, 2000, 2001, 2025, 2026, 2028, 2029, 2040, 2057  
2061, 2065, 2069, 2064, 2066, 2064, 2067, 2113, 2114, 2138, 2147, 2159  
2162, 2165, 2169, 2170, 2172, 2180, 2181, 2192, 2196, 2197, 2199, 2201  
2203, 2204, 2205, 2206, 2212, 2213, 2216, 2223, 2240, 2242, 2256, 2257  
2263, 2278, 2285, 2288, 2294, 2295, 2296, 2297, 2298, 2299, 2309, 2310  
2313, 2314, 2315, 2316, 2317, 2319, 2321, 2331, 2332, 2339.

## ASSESSMENT No. 69.

6, 175, 273, 294, 347, 597, 692, 766, 1134, 1135, 1136, 1556, 1557  
1570, 1650, 1678, 1722, 1737, 1742, 1778, 1916, 1945, 1946, 1947  
1967, 2063, 2066, 2182, 2190, 2236, 2279.

## MISCELLANEOUS.

68.—1854.  
70.—398.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## PRESENTATION.

On Christmas morning the business men of Bryan, Ohio, presented Miss Olive M. Vineyard, Manager of the Western Union Company's office at that place, with an elegant gold watch and chain as an appreciation of her services and her uniform courtesy and kindness.

## EXCELLENT SPORT.

In Peru, where telegraphs are subject to daily interruptions, the inhabitants of the districts traversed by the wires consider it excellent sport to upset the posts and shoot at the operators. At least so says the special correspondent at Lima of the Panama Star and Herald.

THE DENVER (Col.) News takes pleasure in acknowledging the very excellent manner in which the President's Message was transmitted upon the wires of the Western Union Telegraph Company. The management in that city took particular pains in receiving it, and their work was admirably done in all respects.

As showing the extensive use to which the electric telegraph is now applied in the transmission of news for the daily and other papers, it may be stated that one of the Scottish papers—the North British Daily Mail—received by wire eight columns of extracts from the Life of the Prince Consort, and which appeared in its columns the morning after the publication of the work.

## BORN.

HOWELL.—At Stockton, Cal., Nov. 23, 1874, to L. J. Howell, Manager W. U. Tel. Office, Knight's Landing, a son.

## DIED.

McNABB.—At Washington Heights, Ill., Dec. 9, 1874, Robert J., son of Sebastian H. McNabb, aged 1 year, 7 months and 2 days.

## ON THE ELECTROMOTIVE FORCE OF PALLADIUM IN GAS BATTERIES.

(From *The Telegraphic Journal*.)

It was demonstrated by Graham, in one of his latest researches, that palladium has a powerful attractive force towards hydrogen, so that it can condense, in its pores, more than 900 times its own volume of that gas; and further, that the hydrogen thus condensed and combined had a remarkable power of deoxidation, so that it reduces salts of oxide of iron to protoxide salts, and changes red ferrocyanide of potassium into yellow. He conceived hydrogenium (the hydrogen thus combined and condensed) as the active form of that gas, as ozone is of oxygen.

From researches (especially those of Bœtz) on the electromotive force of gas-batteries, it appears that this force depends not only on the opposite affinities of the constituent gases, but also on the power of condensation of the solid bodies forming the electrodes. To this is owing the high electromotive force of a gas-battery with platinum electrodes.

From these data Prof. Villari, of Bologna, was led to anticipate that a gas-battery with palladium electrodes would present a still greater electromotive force than one with platinum electrodes; and his experiments have verified this.

He first tried to compare directly the electromotive force of two gas elements,—one with platinum, the other with palladium electrodes; but secondary actions proved so disturbing that he was forced to reduce the phenomenon to its most simple forms, and then study it. He thus examined, first, the comparative action of platinum and palladium in hydrogen gas; then he compared the action of platinum and palladium in oxygen; and then the action of two gas-batteries.

In reference to the first point it appeared, from repeated experiments (in which two electrodes, platinum and palladium, were immersed in hydrogen), that the palladium was the negative or more readily oxidisable element; and as the two well-polished metals were almost equally unattackable by acidulated water, we must suppose that it is the hydrogen which, in contact with palladium, is more oxidisable than in combination with platinum. This quite agrees with the ideas of Graham. To obtain such experimental results the palladium must be exposed a considerable time to the hydrogen, whether chemically or physically (electrolytically) produced; otherwise very small, and even opposite, deflections may be had, especially with chemically prepared hydrogen. In fact, immediately after contact of the hydrogen with the two electrodes, the hydrogen in contact with the platinum seems the most readily oxidised. This anomaly disappears, however, in a short time, which, in the author's experiments, never exceeded thirty minutes.

It need hardly be said that whenever the palladium is once charged with hydrogen, it is not necessary to prolong the contact of these bodies if they are again to be experimented with, and one may thus, without waiting, change or renew the hydrogen at will. The palladium, so charged, may act for a long time as if it were in contact with hydrogen, and appear as oxidisable element, even if quite immersed in acidulated water. To make the foregoing investigation, then, it is necessary to dehydrogenise the palladium, which can be done in several ways.

The action of oxygen in gas-batteries with platinum electrodes is very complicated. Prof. Villari commenced by taking two ordinary glass tubes,—one containing a platinum, the other a palladium plate, both metals well polished,—and giving no current in the galvanometer, when the tubes were

filled with acidulated water. He next half-filled both tubes with chemically prepared oxygen, and observed that, after a long time, the galvanometer still remained at zero; whence must be inferred either that the metals had no particular influence on the oxygen, affecting its action in any way, or that the influence in both was the same. To decide this he took two polished platinum wires, which, immersed in acidulated water, gave no current; he then filled one of the two tubes with chemically prepared oxygen, and kept the other filled with acidulated water; a slight deflection appeared, which quickly decreased to  $\frac{1}{2}$ , the platinum covered with oxygen acting some time as electro-positive element. It is therefore clear that an action of this kind, perfectly negligible, is also to be attributed to the palladium plate covered with oxygen, and it may therefore be affirmed that these metals have no special influence on this gas. This agrees with the already well known fact that neither platinum nor palladium absorb any oxygen when serving in a voltameter as positive electrode. The action of oxygen is, on the other hand, very lively when it is obtained electrolytically, for in this case it is mixed with a certain quantity of ozone. M. Villari, using two platinum electrodes, observed that the one dipped in ozonised oxygen was strongly electro-positive towards the one in chemically prepared oxygen. With palladium electrodes the phenomena is still more complicated, for, besides the ozone from the chemical decomposition of water, the palladium acting in a voltameter as positive electrode becomes coated with a dark red layer of oxide palladium. This oxide is soon dissolved in unacidulated water, and in a short time the metal takes its original properties; it behaves, further, as a strongly oxidising body. All the observations, including that of the time required for charging of the palladium with hydrogen, fully explain the differences obtained in the first direct comparative experiments with platinum and palladium batteries.

Profiting by the information now acquired, Prof. Villari proceeded to a comparison of the batteries. He charged, in the proper way, a platinum and a palladium electrode with chemically prepared hydrogen, and half an hour after they gave, in the galvanometer, a constant deflection of  $60^\circ$  to  $70^\circ$ , the palladium appearing electro-negative. He also charged two similar electrodes with chemically prepared hydrogen, and they gave no current in the galvanometer. He then formed with these elements two gas-batteries,—the one with platinum, the other with palladium electrodes,—put them in opposing action, and closed the circuit with the galvanometer, which gave an initial deflection of  $90^\circ$ , sinking—with oscillation—to  $20^\circ$  or  $30^\circ$ , later to  $10^\circ$  or  $20^\circ$ , and after some time to zero. The deflections indicated a superiority of the palladium battery. As soon as the galvanometric deflection had sunk only a few degrees, the author compared anew, by means of the galvanometer, the platinum and palladium in contact with hydrogen, and obtained a constant deflection of  $60^\circ$  to  $70^\circ$ , exactly as before this experiment; so that the negative electrodes had not, during this process, lost their action. He compared again the two platinum and palladium electrodes covered with oxygen, which at first, as stated, gave no deflection; and remarked that the latter gave a strong deflection of  $50^\circ$  to  $60^\circ$ , the palladium appearing as the attackable element of the combination.

This observation, repeatedly confirmed, is an indication (M. Villari says) of a secondary polarity appearing in the action of the battery with palladium electrodes, and which weakens its intensity till it is nearly equal to that of the platinum electrode.

A similar phenomenon occurs with the platinum,

so that the platinum cannot be used as positive electrode of the palladium battery. Further, if as soon as the galvanometer connected with the opposing batteries has been deflected only a few degrees, we close one of the circuits for a few minutes with a short copper wire, it is found, on removal of this, that the action of the other battery preponderates, on account of the ordinary secondary actions which weaken more the battery closed with the short wire than that closed with the long galvanometric coil. Analogous observations and comparisons were made on batteries charged with electrolytic hydrogen and with chemically prepared oxygen; and similar results were had, though perhaps less marked than the above, corresponding to the less electro-chemical difference between platinum and hydrogenised palladium.

Lastly, Prof. Villari compared two batteries together, which were charged with hydrogen and oxygen developed electrolytically thirty to forty minutes on each of the platinum and palladium electrodes; and when both were connected with the galvanometer, they gave a first deflection of  $90^\circ$ , and a constant one of  $50^\circ$  to  $60^\circ$ ,—in consequence, again, of the superior electromotive force of the palladium battery. It is to be noticed in this case, however, that the palladium—which acted as positive electrode—got covered with a dark red layer of oxide of palladium, which evidently increased the action of the battery: an action which, after consumption of the oxide, greatly diminishes, so that after some hours the intensities of the currents of both gas-batteries almost perfectly compensate each other.

These, then, are the actions which occur in a gas element with palladium electrodes. It is fully ascertained, from experiment, that such an element possesses a greater electromotive force than a Grove element, as the hydrogen brought in contact with the palladium (*i. e.* the negative electrode) is much more readily oxidisable than the hydrogen in contact with the platinum. This electromotive force increases yet more if the palladium which is in contact with oxygen (*i. e.* the positive electrode) is oxidised, because it acts then as a very oxidisable body.

## A NEW FORM OF ELECTRO-MAGNET.

A contributor to the *English Mechanic* thus describes an electro-magnet constructed upon a novel plan and possessing a power far greater than those of the ordinary type:

"First, I took a number of pieces of iron wire, 16 gauge and 12 in. long, and commencing half an inch from the end, I wound fine silk-covered wire (as used for the secondary in coils) for  $2\frac{1}{2}$  in. down, then gave two or three long turns, carrying the wire to within 3 in. of the other end, and wound that in the same manner as the first, and leaving long ends of the fine wire for subsequent attachment. The covered wire was then dipped in a spirit varnish and put aside to dry. When I had covered a number of these I bent them up into the form of a horse-shoe magnet, and put around them a number of pieces of similar wire, but uncovered, so that I had a horse-magnet much resembling the bundle of wire in the core of a 'coil.' The whole lot were then wound with eight coils of 16 gauge covered wire in the usual manner, and all the ends of the fine wires soldered to the outside copper wire. The result quite surprised me, and no doubt will be of some use to those who do not mind a little trouble for the sake of a superior article."

The traffic receipts of the Direct Spanish Telegraph Company for the month of October amounted to 1,386.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, JANUARY 1, 1875.

### MORE DISAPPOINTMENT.

The Direct United States Cable is as yet incomplete, while, for mysterious movements, sudden appearances and disappearances, the *Faraday* bids fair to rival that phantom ship of old, the *Flying Dutchman*. It will be remembered that, after a long disappearance, it was reported, on Nov. 25th, that she had recovered the cable which had been buoyed about 200 miles from the American coast, some weeks previous, and, owing to unfavorable weather, was again forced to abandon it. We now have reports from her up to Dec. 19th, and learn that during the long silence she had been engaged in taking up some forty miles of the shore cable which was laid last Spring, and had laid about ninety knots additional to the cable which had originally been buoyed off Newfoundland, and that *this* end is now buoyed. This is the latest and it is only thirteen days old.

It was not intended that the notice in reference to the new tariff books in the JOURNAL of Sept. 15th should have given the impression that they were to be generally distributed. The books should be ordered only by offices whose books of 1872 are unfit for use. The new issue is intended more particularly for sale to the public, and copies for customers will be furnished by the Tariff Bureau upon requisition through the Superintendents.

THE attention of Superintendents and Managers is directed to the Executive Order which appears on the sixth page of this issue. It involves a change in the treatment of Government messages, and revokes Executive Orders Nos. 125 and 144, which heretofore have governed this class of business.

THE quarterly dividend of two per cent. declared by the Western Union Company, is payable at the office of the Treasurer, on and after January 15th.

### THE TROUBLES OF THE FRANKLIN COMPANY.

The joke which was lately perpetrated by the managers of the Atlantic and Pacific Company upon the stockholders of the Franklin Company turns out to be no joke after all. They have actually confirmed the lease which they had made to themselves by the same vote by which it was consummated, and the minority of the stockholders (a majority in number) have made good their threat of throwing the matter into the courts. Upon their petition the Supreme Court of Massachusetts have ordered all parties who may be interested to appear before them on the first Monday of February next, that they may then and there show cause why the prayer of the petitioners should not be granted. The wording of the petition is in plain Anglo-Saxon—with no mincing of terms. It is signed by George R. Williamson and seventy-four other stockholders of the Franklin Company, and in effect recites that the Atlantic and Pacific Telegraph Company has purchased a majority of the capital stock for the purpose of controlling the Franklin Company in its own interest; that by means of said control it has elected new officers, of which only one is a resident of Massachusetts, while there is reason to believe that all own stock or have a pecuniary interest in the Atlantic and Pacific Telegraph Company; that at least four of the Directors are not stockholders in the Franklin; that the Treasurer chosen is the Treasurer of the Atlantic and Pacific; that in pursuance of a plan to deprive the minority of the stockholders of the Franklin Company of their rights, and to greatly benefit the Atlantic and Pacific Company, a meeting was held on a call which is believed to be inadequate, at which authority was given to lease the Franklin Company to the Atlantic and Pacific Company for ninety-nine years at an annual rental of \$25,000, which was a grossly inadequate rent, its value being at least \$40,000; that an offer of \$35,000 a year was made and was refused by the President, who also refused to call a meeting of the stockholders to consider the same, but thereafter made a lease to the Atlantic and Pacific Company at a grossly inadequate rental, and in fraud of the rights of more than one-third of the stockholders; that the President refuses to exhibit the lease to stockholders or to disclose its terms and conditions; that said lease was never legally voted by said Franklin Telegraph Company, and that if it was so voted, it was carried by means of the vote on the stock held by the said Atlantic and Pacific Telegraph Company, and that said Atlantic and Pacific Telegraph Company intend to defraud and are defrauding the stockholders of the Franklin Telegraph Company of their just rights in the premises; and praying that said lease may be vacated; and that the said Franklin Telegraph Company may be dissolved and a receiver of its property and assets appointed to sell the same, and after payments of its debts, divide the proceeds among its stockholders.

This is a very concise and interesting statement of facts apparent to the petitioners, and in the interest

of business morality we hope that the transaction upon which the petition is founded will be thoroughly ventilated. The public will also be glad to learn how "lateral lines can generally be acquired without expense," which the Atlantic and Pacific Company profess to be able to do. We trust that the Company will, at the hearing, have an opportunity to "rise and explain."

### THE SIGNS OF THE TIMES.

One of the indications of our advancing telegraphic civilization was very manifest in the recent organization of the American Electrical Association at Chicago. It was a step demanded by the times. But there is much to be done before such an organization can be widely and effectively influential. There is a process of education to be begun, not by publications alone, but by personal training and study. Many who have been content with a knowledge of the simpler elements in telegraphy must go to school. To understand and enjoy the proceedings of a scientific congress we must learn its idiom, and become accustomed to its language and methods of thought.

So we are glad to learn that it is proposed to form in New York, a class in telegraphic science, over which shall preside a competent teacher to direct its studies. It may be that by the time this reaches the eyes of our readers this class will be organized. Several names of earnest men have already been given as applicants for membership. The result of this initiatory step will undoubtedly lead to a more vigorous movement in the direction of an eastern organization similar to the one in Chicago. New York indeed, is, in some respects, the only proper centre for such an organization, although there may well be two, one for the east and another for the west. In New York naturally centre many facilities for scientific investigation as well as the men of science whose names are national. It is, therefore, with no desire to underrate the value of the Chicago movement, but rather otherwise, that we hail the signs of a similar movement in the east, and especially of that feature of it which aims at education as the first element of success.

THE snow storm which occurred on Sunday, Dec. 20th, played sad havoc with the Police and Fire Alarm Lines of this city. Their wires were broken in every direction, and for three or four days the telegraph service of these departments was utterly demoralized. A more perfect wreck could hardly be imagined. The compound wire with which these lines were constructed was greatly inferior in strength to the ordinary galvanized iron wire used by the Western Union Company. An examination of the wires which laid upon the ground showed not a trace of copper, nothing but the steel, nearly eaten through by rust.

These are the lines erected by contract, for which the city was charged the enormous sum of \$850,000, which is at the rate of \$10,625 per mile of poles, and \$1.360 per mile of wire.

# ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from page 375, Vol. VII.)

The Committee on Appropriations of the House of Representatives resumed their sitting on May 29th, 1874, when Mr. Lowrey continued his argument on behalf of the Western Union Telegraph Company, as follows:

Mr. CHAIRMAN: At the close of the last meeting I was engaged in an effort to refute the assumption (which must be one of the necessary supports of this bill as a proper exercise of constitutional power) that the people of the United States have conferred upon Congress a power of control, necessarily exclusive, over the business of *communicating information*.

The fact that Congress is authorized to establish post-offices and post-roads is relied upon as authority for this proposition, and, in controverting it, I was led to remark that the post-office is not primarily an agency for communicating information, but an agency for carrying certain parcels known as mail matter. I fear that I was not able at that time to convey my precise meaning, and therefore I return briefly to this matter. Suppose a company should be organized for the purpose of employing messengers to run of errands, as in the City of New York, where we have what is called the Soldiers' Messenger Company. Suppose the business of the company was to send a messenger to any man's house who might want a message delivered; the messenger there to listen to what was said to him, and to go and report it to the intended receiver. Suppose that business should grow large, by reason of the messengers being faithful, trustworthy, intelligent and fleet-footed, so that the public came to trust them very much, and to send for them whenever a man wanted anything communicated. Suppose the business should become so large as to meet Mr. Hubbard's apparent idea of what constitutes an interest a national one, and that Congress should be asked to pass either for the Government to undertake that messenger business itself, or to set Mr. Hubbard up in it. Could such a bill be sustained on the ground that Congress has authority to establish post-offices and post-roads? Would it do to say that, because the post-office is a means by which information may be sent, and a messenger company is another, and because Congress has got the authority of establishing the one means exclusively, that it has therefore absolute control over all other means for that end which may be devised? I do not suppose that anybody would sustain such a claim.

Now, in regard to the exact functions of the post-office. It has neither sense of sight, or hearing, or touch, or faculty of comprehension of anything except a ponderable article which is brought to it. It does not know what that article contains. If the post-office official be bright or stupid, or the letter-carrier bright or stupid, it is all the same to the receiver and sender. The information which he gets is in no wise information for or from the post-office. All that the post-office does is to deliver the package, which may contain seed, or may contain information. If the sender should come to the post-office with information of a fire in Baltimore, and should say to the post-office, "I wish you to let Mr. Jones in New York know of this great fire in Baltimore," the post-office could not hear or comprehend him. It has no means of communicating his information as information, but it says to him, "If you want to convey this information to New York, wrap it up and seal it and we will take the package to New York for you." It is plain, therefore, that the post-office does not deal with informa-

tion as information; and the argument that the Constitution authorizes Congress to deal with information as such has no basis. It authorizes the establishment of that peculiar known agency called the post-office; and the fact that it went no further shows that there are the limitations of congressional power upon this subject. The Government may control all such communications as are made in the form of sealed letters; as to all other communications between the people, they are reserved for such control as was in the people or the States when the Constitution was adopted.

Now I come to the method of communication by telegraph. It is merely an extension of the sense of hearing, and of the distance at which the human voice may be heard. The waving of flags by concerted signals is a means of communicating information. If a man goes to a person who, instead of tapping upon an electrical instrument, should be able to go into a mesmeric trance, and in that state be to impress another person in New York with the idea that a correspondent in Washington wishes him to buy five hundred shares of stock, that would be another mode of communicating information. Is that like the post-office? Is it to be supposed that, because Congress established the post-office, it must also assume charge of all people who go into mesmeric trances for this purpose? That is just the difference between the post-office and any other means of communicating information pure and simple; and it will be found, upon any accurate and proper analysis of the functions of the post-office and of other means of communicating information, that the attempt to sustain the control of the Government under the post-office clause is a perversion of all true methods of reasoning.

In leaving this discussion I repeat the query, do the Committee believe that the words "Congress shall have power to establish post-offices and post-roads," are convertible with the formula in which Mr. Hubbard's construction of these words must be stated, viz., "Congress may assume jurisdiction and control of all means, whether now existing or hereafter to be found out, by which the people may communicate their thoughts." If these phrases are convertible, then a constitutional amendment is requisite to put the post-office clause in form to authorize the passage of the present bill.

The only other clause of the Constitution to which Mr. Hubbard refers is the commercial clause. Congress has the power to establish post-roads. It has the power to regulate commerce. The difference in the language indicates the natural distinction, which, in the judgment of the formers of the Constitution, exist between the two things. The one was something to be established. It was a thing in itself susceptible of one control. It can be established as a business. But commerce the Constitution found in existence. It is the intercourse and exchange of mankind. The Constitution has not created commerce. Governments have not created commerce. Governments are created for the purpose, among other things, of protecting commerce, which existed before governments were thought of. The Supreme Court has said that commerce is all intercourse; but is letter-writing intercourse in that sense? I think not. I do not believe that it will ever be found, on a proper construction, that telegraphing is commerce at all. Telegraphing is merely (to revert to the illustration I gave a moment ago) such communication as may take place between a man with a flag and telescope at Arlington Heights and a man with a flag and telescope here. That is not commerce. It is direct intellectual intercourse, and no people has granted, nor has any government ever assumed, the

general control of such intercourse. That great numbers employ it is not only not a reason for, but a conclusive reason against, government interference with any means of intercourse except that one—the post-office—expressly passed over to congressional control. *Expressio unius est exclusio alterius*.

Mr. HUBBARD. There is an opinion of Attorney-General Hoar stating that telegraphic communication is commerce.

Mr. LOWREY. There is an opinion of one of the Attorney-Generals, in which he says that it assimilates to commerce, and that Congress has at various times passed acts concerning it. The acts he referred to were those authorizing the landing of cables on the coast, but none of them assumed to influence the use of those lines, &c. That was all that was said. After this opinion has been read, if it says anything more than I now state, I think the Committee will doubt it. The question as it now arises was not presented to Judge Hoar. There is a great deal of ignorance about the matter of telegraphing. The suddenness of the invention, the mystery of its operation to the people who have no time to investigate it, has all left, even on intelligent minds, a curiously wrong idea about it. Mr. Starkweather referred the other day to a class of cases brought against telegraph companies. I have no doubt he knows that when people come to consult him in regard to suits against a telegraph company, they have the vaguest idea as to what the telegraph company has undertaken to do for them; and they think it has undertaken to do more than any contractor has ever undertaken to do. The telegrapher has no means of telling whether he sends his telegraph correctly. He may send the same message a thousand times, and he cannot tell whether he has sent it correctly, except by the process of its being repeated back. It is as if I were to repeat here a certain formula of words and you should try to take it all down. You could not be sure that you had done so until after a certain proof-reading. That is done in telegraphing, when specially paid for, at a rate which merely covers the cost of the repetition; and it is that alone which gives certainty. And yet people complain of the telegraph because it does not do its writing with an accuracy which no man ever does when he writes a letter. I presume that no gentleman present writes a letter that he does not read over to see if he has not omitted a word. The telegraph operator cannot do that. He hears sounds from his instrument and writes the interpretation of it as it goes along, leaving no record. Yet it is supposed that the telegrapher must write more accurately than a person who writes leisurely at his table.

I was proceeding to say that telegraphing is not commerce. But suppose it is such a servant to commerce that it is to be called commerce itself, (and I do not know that I have any objection to that,) still what may Congress do in regard to commerce? Establish it? No; regulate it. What is the creation of a company to build a railroad? It is the establishing of a railroad. It is not the regulating of a railroad. The distinction between establishing and regulating is this: That, as to commerce, Congress has the right to regulate that which it finds in existence—that is to say, to protect it. The motive of this clause in the Constitution was that there should cease to be those onerous and annoying exactions at State lines which at the time existed. It was not that Congress should have power, at any time, to set anybody up in business in commerce. Nor has that power, within my knowledge, ever yet been asserted. But suppose that this was not so; Mr. Hubbard's bill does not come within the power to regulate commerce because it is commerce among the several



States, with Indian tribes and with foreign nations only, which Congress is to regulate. Here is a bill to authorize the telegraph business all over the country and within each State; as much between New York and Rochester as between New York and Boston. The justification of this interference within a State is that the business of telegraphing has become so large and the communications by telegraph have become so numerous. That claim, being analyzed, turns out to be this: It is supposed that because this means, which is simply the means for the rapid and accurate communication of thought between people, has come into extensive use the Government has a duty concerning it. This Government was organized for no such purpose. The people of the United States need no governmental aid in their intellectual intercourse; nor, when the subject is understood, will they tolerate it otherwise than in the express limited method fixed by the Constitution.

Any claim to control the telegraph, irrespective of State lines, as a means of communicating information, applies with equal force to the printing of newspapers in the State, the printing of books, and the circulation of books and papers, and every method by which men are able to share their knowledge and thoughts with others at a distance. In fact Mr. Hubbard's whole scheme, and, I apprehend, the scheme of the Postmaster-General, is based on misconception of the powers of this Government—apparent indifference to the purposes for which it was created—and a blind heedlessness of the limitations of power inherent in its nature.

I now approach a branch of the subject which is a little more difficult. The one which I have left is, to my mind, comparatively easy. The difficulty in the other consists in the fact that we begin now to deal with figures, and, as it was said of the Christian religion in early times, that it contained "depths where an elephant might swim, and shallows where a mouse might ford," so whoever deals with estimated figures and comparative statistics will find that statistics are easy or difficult of comprehension as the expert manipulator chooses to make them. On our part, however, we propose not to deal with estimates nor guesses, as Mr. Hubbard, on his part, has necessarily to do, since he has a problematical case to establish.

I shall deal with actual facts of experience, and shall hope to escape entanglement with Mr. Hubbard's artificial web of conjectures and hypothetical calculations upon the future, by confining myself to the established experience of actual history. I shall ask the Committee to accompany me in a little excursion through the history of the assumption of the English telegraph by the English Government. And here I may remark, without at all deprecating the talent and industry which Mr. Hubbard has brought to the advocacy of his project, that I have been amazed, and not a little amused, on reading the history of this business in England, to discover that that which I supposed to be original here, and perhaps a creditable American notion in regard to the telegraph, is entirely borrowed from English blue-books. Mr. Hubbard's theories are but the faint re-echo of this English business. On going through the blue-book, I find our old story, with all the variations and inflections. When Mr. Scudamore goes up, and hopes and estimates boldly, Mr. Hubbard goes up; and when Mr. Scudamore doubts and goes down, Mr. Hubbard goes down.

Mr. Scudamore is to be credited with the assumption of the telegraph by the English Government. He is an English gentleman, of that thorough training which English men of business receive. He has been connected with the post-office department since 1840, and has risen to high rank in it, that of Second

Secretary to the post-office. He knows the post-office thoroughly. He began about 1860 to study the subject of uniting the post-office and the telegraph in England. It was very interesting to him. He went abroad and examined all the systems of the continent. He sent expert persons abroad to examine them. He spent five or six years in a careful study of the subject—a study such as is very seldom here to any question of administration. Of course, he had first to deal with Parliament and with the committees of Parliament. He entered upon this gay and joyous business of making estimates, (perhaps, after all, the lightest occupation one can undertake who has no pecuniary responsibility for results,) with a spirit as hopeful and prophetic as Mr. Hubbard now exhibits. He stated before the parliamentary committee his first estimate, after years of study and examination, of the cost of the telegraph as £2,400,000. That was all that was to be paid to put the Government in possession of all the means of telegraphing, then existing in the United Kingdom, and to give it all that it wanted to carry on the business. Soon he thought it would take £3,000,000. That raised some little criticism. Then it became £3,600,000. That excited a good deal of remark and a good deal of critical discussion. Then he said he could do it for less than £6,000,000.

By that time he had got the Government committed to his plan, and Mr. Gladstone was attending hearings before the Committee. Mr. Scudamore was fairly launched. The responsibility was off his shoulders. When the bill was passed it gave him £7,000,000 for the purpose. The next year it took, in fact, £8,000,000. The next year £9,000,000. And up to the present time it has cost the English Government about £9,250,000 to pay for what, in the beginning, Mr. Scudamore said would cost £2,400,000. And now I think it will enlighten the subject a little if I read briefly from this blue book. It will show us the termination of the road which Mr. Hubbard invites us to travel.

The CHAIRMAN. What is it?

Mr. LOWREY. Mr. Hubbard invites the Government to undertake the business of telegraphing with him; that is to say, he puts forward the post-office to contract with third persons, both for receiving and sending telegraph messages; he to perform a part of the service for the larger share of the pay, but without responsibility to the customer or the Government. Mr. Hubbard estimates that the existing lines, or equivalent new facilities, can be got for a certain amount. Mr. Scudamore estimated that he could get the existing lines for a certain amount. He was no amateur. He was a business man, acting under official responsibility, and with a business reputation and political standing to lose. Now, I am going to show you how fatally misleading were all the calculations of this astute, practical and earnest gentleman, when he undertook a business which he did not understand.

I read from the special report of the select committee on the electric telegraph bill, together with the minutes of evidence ordered to be printed by the House of Commons on the 16th July, 1868:

(To be Continued.)

#### ELECTRIC LIGHTS FOR LIGHTHOUSES.

It is stated that the two lighthouses at the Lizard promontory, on the southern coast of England, at the entrance of the British Channel, are about to be fitted with the requisite apparatus for exhibiting the electric light. In experiments recently made near Paris, with an electric light specially adapted for illuminating distant objects, it was found that distance up to ten miles could be clearly brought out, and by means of telescopes every point in the cone of light could be reconnoitered.

#### A NEW WORK OF INTRINSIC VALUE.

### THE LIFE OF SAM'L F. B. MORSE, LL. D., INVENTOR OF THE Electro-Magnetic Recording Telegraph, BY SAMUEL IRENÆUS PRIME, S. T. D.

This volume presents the most romantic and extraordinary story in the annals of science and art. It is a popular and authentic account of the greatest discovery and invention of ancient or modern times.

On the death of Professor Morse, his family and executors united in requesting the author of this volume—long a personal friend of the great inventor—to take his books and papers and prepare a biography for general reading. The author is widely known as an editor, and by his numerous volumes of travel, etc.

The volume is illustrated with portraits of Morse, Humboldt, Lafayette, Arago, pictures of Morse under various circumstances, copious drawings of the several parts of the Telegraphic Apparatus, each step being illustrated by a drawing made by Morse himself for the purpose, the whole series exhibiting a perfect and intelligible history of the invention, development, introduction, progress and triumph of the American Telegraph, which now is employed upon ninety-five of every hundred miles of line on the globe.

The original documents necessary to the fullest vindication of the truth are here given. And all the descriptions and illustrations, with diagrams, are presented, that the general reader and the student of science may readily apprehend the origin and advancement of the most wonderful of all human inventions.

The Life of Professor Morse herewith offered to the public will become a permanent source of knowledge and entertainment in every intelligent household, and should form a part of every public and private library.

The work makes a neat octavo volume of 788 pages, and is sold by subscription.

#### AGENTS WANTED

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NEW PERFECTED GIANT SOUNDERS,  
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Upon receipt of plans of houses, we will send skilful mechanics to estimate upon work or will give any information in writing that may be required. Liberal commissions will be paid upon any orders that may be secured for us.

Our Alarms and Annunciators have just been awarded the First Premium of the American Institute. Explanatory Circulars will be furnished upon application to the Secretary.

L. G. TILLOTSON,

President.

CORNELIUS ROOSEVELT,

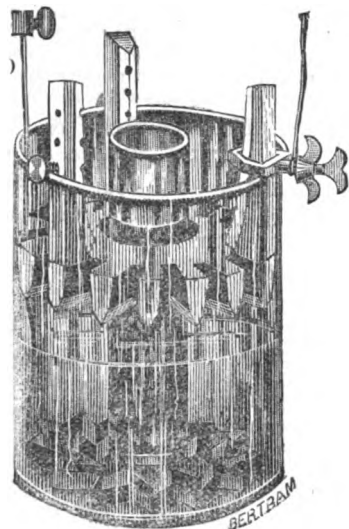
Sec'y and Treas.,

40 West 18th Street, N. Y.

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## THE BALTIMORE BATTERY.



Acknowledged SUPERIOR to any other for telegraph purposes. Every comparative test made the past year resulted in the adoption of our battery.

A prominent Superintendent writes:—"My impression is the Baltimore is to be the battery of the future." He has others in circuit to determine the value of each in service.

It is now in use on *Commercial and Railroad Lines*, *Stock Reporting Telegraphs*, *Private Lines*. Superintendents *Fire Alarm Telegraphs* recommend it as the most reliable they have used.

Thousands furnished Gold and Stock Telegraph Co. of New York, who use no other.

For closed circuits it is without a rival.

All kinds of Battery and Battery Material for sale by

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Our ILLUSTRATED CATALOGUE now ready.

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KEEP IN STOCK THE FOLLOWING ARTICLES:

GALVANIZED WIRE,  
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BRACKETS, PINS, SPIKES,

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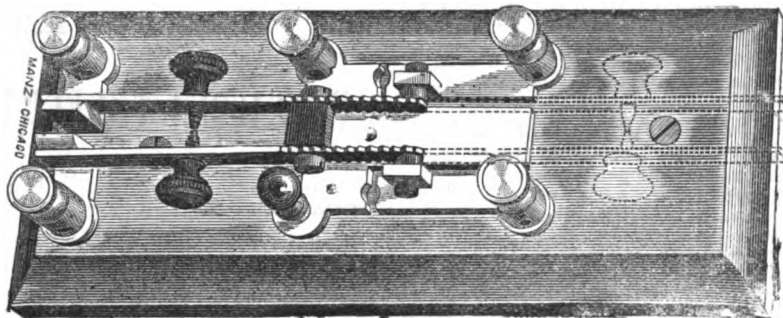
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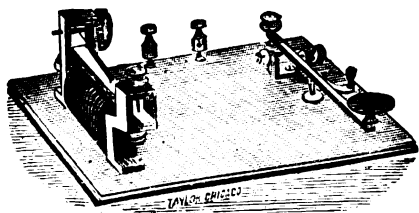
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Our Morse Instruments are of the Western Union, Ottawa (or Caton) style.

We have ample facilities for the execution of every variety of electrical work.

## THE AMATEUR'S Telegraph Apparatus.

(PATENTED APRIL 16TH, 1872.)



With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

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There are several thousand in use.

### PRICES.

Complete Outfit .....	\$7 50
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## GEO. H. BLISS & CO., Telegraph Machinery

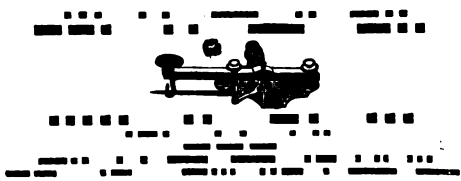
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They solicit the patronage of their friends and the  
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## The "Snapper" Sounder.



TRADE MARK. PATENTED MAY 12th, 1874.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 40c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

**PRICE 75 CENTS.**

Sent post-paid on receipt of price.

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Glass Scroll Bird Cards, with name printed in gold, 50 cts. per doz.; sample with specimen of Operators' electrotype card of Key, Sounder and Battery, complete, sent for three cents.

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Thirty varieties of Calling Cards. The handsomest and most fashionable collection to be found. I allow Agents 25 per cent. All sent, with Agents outfit, for 25 cents.

Address to

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Of the size and thread used by the Western Union Telegraph Company

Having secured an Exclusive Agency for these Insulators (manufactured under the Cauvet patent), we are filling orders promptly for large or small quantities, at prices as low as any Insulator can be sold for in the market.

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## Security Message Hook.

PATENT APPLIED FOR.

The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

Price 30 cents each.

Price per dozen \$3.00.

LIBERAL TERMS TO THE TRADE.

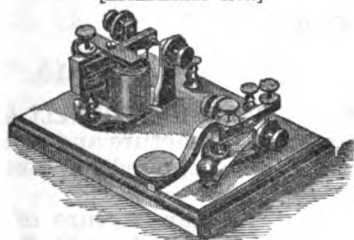
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GENERAL AGENTS.

CHARLES WILLIAMS, Jr.,  
109 COURT STREET, BOSTON.

[ESTABLISHED 1856.]



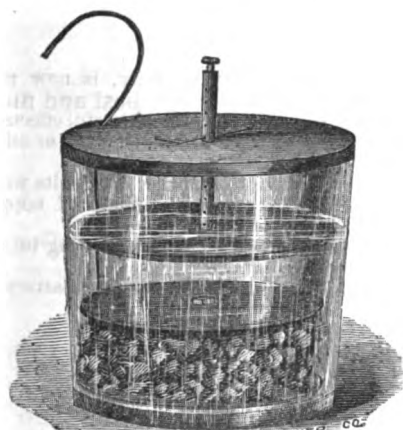
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Price per Cell, \$2.

This Battery gives a stronger current than the same sized Hill or Callaud Cup. It will run as a local battery for six months without attention, and as a main battery for a longer period.

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## The Only Perfect Main Line Sounder.



Our WRECKING INSTRUMENT is still popular with managers of Railroad Telegraphs, who find an attractive combination, giving loud sound without materially increasing the resistance beyond the standard of their relays.

We have removed some of the old box Sounders, in which we found the helices to have a resistance equal to 400 and 450 ohms; none of our wreckers have over 175, while 150 is the standard.

## BRASS or NICKEL-PLATED

Always on hand.

No LOCAL REQUIRED. ALWAYS READY FOR  
TEMPORARY OFFICES.

JUST WHAT IS WANTED FOR OFFICERS' CARS.

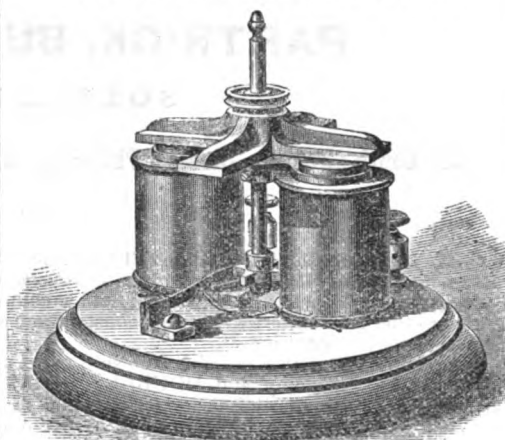
Two sizes, Black Walnut Cases. Handsome Leather Cases, Velvet Lined, to order.

See our advertisements in other columns.

WATTS & CO.,

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[PATENTED SEPT. 29, 1874.]

## THE FAIRY ELECTRIC ENGINE.

A perfect working model of an engine Run by Electricity!  
It will work well with an ordinary local battery.

Price, with two cells Eagles' Metallic Battery.....\$6 00  
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AND

POLICE TELEGRAPH.

GAMEWELL & CO., PROPRIETORS,

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ELECTRICAL CONSTRUCTION & MAINTENANCE CO.  
San Francisco, Cal. Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central office, or upon the

AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM reliability:

Albany, N. Y.,	New Orleans, La.,
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Boston, Mass.,	Newark, N. J.,
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Baltimore, Md.,	Philadelphia, Pa.,
Chicago, Ill.,	Pittsburg, Pa.,
Cincinnati, Ohio,	Portland, Me.,
Columbus, Ohio,	Peoria, Ill.,
Cambridge, Mass.,	Providence, R. I.,
Charlestown, Mass.,	Quebec, L. I.,
Covington, Ky.,	Rochester, N. Y.,
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Dayton, Ohio,	Indianapolis, Ind.,
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Fall River, Mass.,	St. John, N. B.,
Fitchburg, Mass.,	Springfield, Mass.,
Hartford, Conn.,	San Francisco, Cal.,
Jersey City, N. J.,	Savannah, Ga.,
Louisville, Ky.,	Syracuse, N. Y.,
Lawrence, Mass.,	Troy, N. Y.,
Mobile, Ala.,	Toledo, Ohio,
Montreal, Canada,	Toronto, Canada,
Milwaukee, Wis.,	Washington, D. C.,
New York City,	Worcester, Mass.,
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The distinctive features of these systems of  
FIRE ALARM AND POLICE TELEGRAPHS,

ARE,

First—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables any one—even a child—to give an instantaneous, general, and definite alarm of fire.

Second—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked without the constant personal attention of either operators or watchmen.

Third—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

Fourth—The ELECTRO-MECHANICAL GONG STRIKER, for hose and engine houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

These features combined form the

ONLY PERFECT, COMPLETE, AND RELIABLE SYSTEM

OF

FIRE ALARM TELEGRAPH IN THE WORLD.

Messrs. GAMEWELL & CO. are the owners of the original FARMER AND CHANNING PATENTS, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or effort to secure improvements, and the systems are now covered by

MORE THAN TWENTY PATENTS.

The introduction and operation of the  
AUTOMATIC SYSTEM

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy upon application as above.

## A SUPERIOR PRINTING TELEGRAPH INSTRUMENT, FOR PRIVATE AND SHORT LINES.

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1879.*  
The undersigned is now preparing to supply the improved and superior

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manufactured under the patent of Mr. J. E. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is SIMPLE, RELIABLE, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

### PRIVATE LINES

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employees, &c., for the introduction of the Printer. For further particulars, terms, &c., apply to

### MERCHANTS' MANUFACTURING AND CONSTRUCTION CO.,

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(Established 1820)

MANUFACTURERS OF EVERY DESCRIPTION  
INSULATED WIRES

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"Save the Pieces."

This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS.

When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 25 cents each. Sent by mail on receipt of price.

Price per dozen, - - \$1.80.

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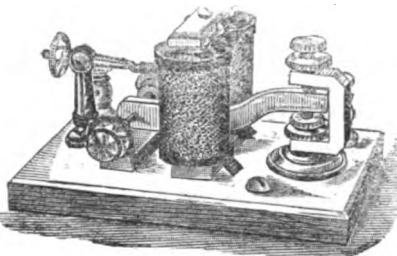
Manufacturer and Dealer in

## TELEGRAPH INSTRUMENTS.

341 Newark Avenue, Jersey City, N. J.

Now offer for sale, or will manufacture to order all kinds of Telegraph Material.

### NEW STYLE SOUNDER—"UNCLE SAM."



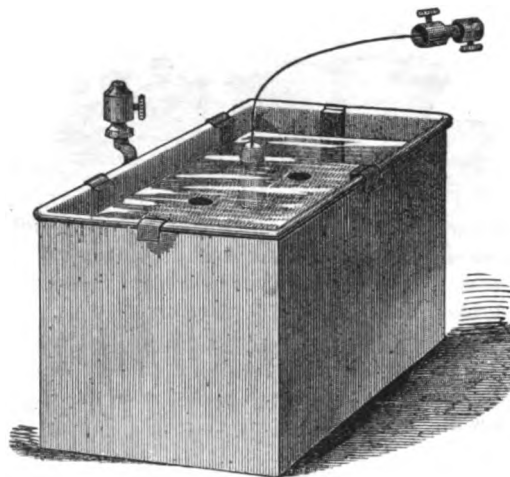
Price \$6.00.

**COPPER  
OFFICE AND MAGNET WIRE,  
BRAIDED AND WOUND,  
SINGLE and DOUBLE, with COTTON,  
LINEN, SILK;**

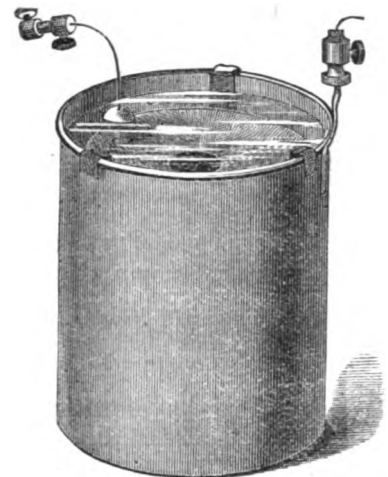
Paraffined or Varnished, Compressed and Polished.  
Manufactured and for Sale by

**WESTERN ELECTRIC MANUFACTURING CO.**  
CHICAGO.

## EAGLES' METALLIC BATTERY.



LOCAL.



MAIN.

## TAKE NOTICE.

New York, Oct. 15, '74.

Notice is hereby given, that I have appointed Messrs. PARTRICK, BUNNELL & CO., of New York and Philadelphia, as Sole Agents for the manufacture and sale of The Eagles Metallic Galvanic Battery, for which I have applied for Letters Patent of the United States.

I hereby enjoin all other parties against attempting the manufacture of said Battery, or the sale of the same, except through my authorized Agents, Messrs. PARTRICK, BUNNELL & CO.

**EDWIN EAGLES,**

Inventor of "The Eagles Metallic Galvanic Battery,"

22 DEY STREET, NEW YORK.

## THE EAGLES METALLIC GALVANIC BATTERY,

**PARTRICK, BUNNELL & CO.,**

**SOLE AGENTS,**

38 South Fourth Street, Philadelphia, and 22 Dey Street, New York.

THE EAGLES METALLIC BATTERY, after two years of trial in every capacity, is now presented with *unqualified endorsements from all directions*, as being without question the **best and most powerful of all constant batteries**, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and **DOUBLE THE AMOUNT OF POWER** of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and *always gives uniform strength of current.*

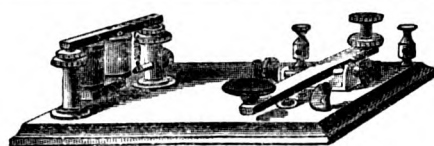
For open circuits, where all other gravity batteries are *acknowledged failures*, the Eagles Battery is found to be, in every respect, a *perfect success.*

## PRICES:

No. 1, Square Cell, complete,	-	-	-	-	\$2.25
" 2, " " " "	-	-	-	-	2.00
" 1, Lead Jars,	-	-	-	-	1.50
" 1, Zincs, with wires fastened in,	-	-	-	-	70
" 2, Lead Jars,	-	-	-	-	1.80
" 2, Zincs, with wires fastened in,	-	-	-	-	65
Insulating Fenders, each,	-	-	-	-	8

*Other Sizes than the above, for special work, furnished promptly to order.*

**SEND STAMP FOR CIRCULAR.**



PATENTED JUNE 24, 1873.

## SPECIAL NOTICE.

THAT  
"THE BEST IS ALWAYS CHEAPEST"  
as demonstrated by the unprecedented demand which has  
arisen for our

## Excelsior Telegraph Apparatus

For STUDENTS and AMATEURS.

The custom introduced by us of making Agents of Managers and Operators, and sharing the profits from the sales of these instruments with them, has also assisted in increasing our sales to such an extent that we have been compelled to enlarge our facilities for their manufacture.

We are now prepared to furnish these unrivalled Amateur Instruments, with or without Office Outfits, in any quantity, and at a moment's notice. Our Agents may now send in their orders as rapidly as they please, and can rely upon their being promptly executed.

### PRICES AS HERETOFORE.

Instrument Complete, Key and Sounder ..... \$6 50.  
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Two Instruments and Outfits ..... 14 50.

L. G. TILLOTSON & CO.,

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104 CENTRE STREET, N. Y.,  
TELEGRAPH ENGINEER,

And Manufacturer of

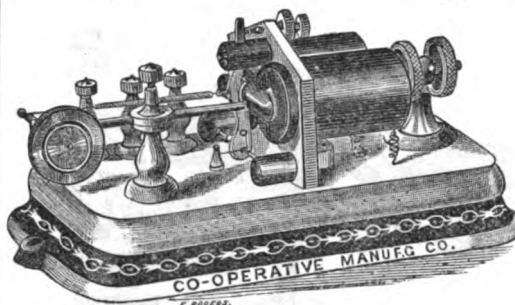
INSTRUMENTS, BATTERIES,

AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES.

Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their business, domestic and foreign, enabling them to keep pace with telegraphic progress.

They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

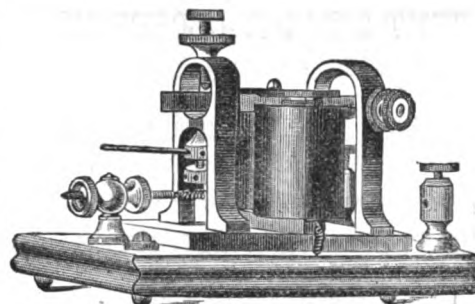
## Co-operative Manuf'g Co., 216½ Walnut St., Phila.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. Is finely finished.

Price, - - - - \$16.



Railroad Sounder.

This Sounder is noted for its loud, clear and firm tone, entirely free from that sharp ring peculiar to most instruments, and which eventually becomes so painful to the ear of the operator.

N.B.—We have improved our Sounders by using capstern head screw and nut, as represented in cut.

Price, \$7. By the Dozen, \$6 50.

Sent by Express, C. O. D., or upon receipt of money order.

### SEND FOR PRICE LIST.

W. R. BALDWIN, Manager, 216½ Walnut St., Phila.

## CALLAUD BATTERY,

KEPT ON HAND,

AND

Orders filled by

W. MITCHELL McALLISTER,

728 Chestnut Street, Philadelphia,

CHARLES WILLIAMS Jr.

109 Court St., BOSTON, MASS.

AND BY

THE WESTERN ELECTRIC MANUF'G CO.,

Agents for the United States,

220 East Kinzie St., Chicago, Ill.

## LECLANCHE BATTERIES.

### IMPORTANT NOTICE.

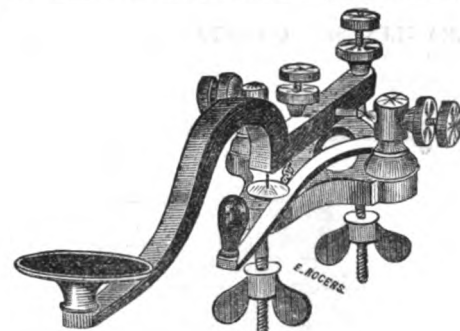
After January 1st, 1875, we will allow 20 Cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

THE LECLANCHE BATTERY CO.,  
40 West 18th St.

Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
8 Dey St.

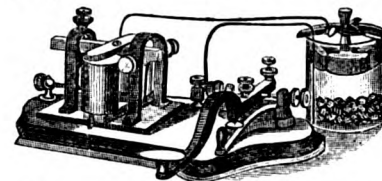
PHILADELPHIA: 54 South Fourth Street  
CINCINNATI: 22 West Fourth Street.



No. 1 Key.

This Key is of a beautiful design, and durable in construction, and is perfect in all things which constitute an excellent working Morse Key. No. 1 Key Curved or Straight Lever.

Price, - - - - \$4 75



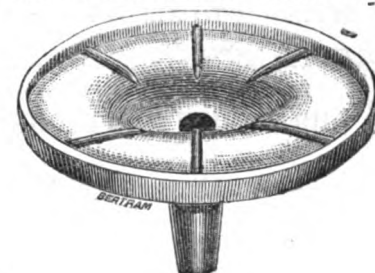
Co-operator's Learner's Instrument.

A complete outfit, embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practising or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined. The instructions are clear and practical, and contain all information necessary for the student. All technical terms and expressions are avoided, as they only perplex and make the road to knowledge more difficult.

Learners' Instrument complete, \$9.50  
without Battery, \$8.00.

No. 2 Learner's \$5, with Battery, \$6 50.

## PATENT BATTERY INSULATOR.



"As near perfect as we can reasonably expect in a contrivance for this purpose."

THE BEST BATTERY INSULATOR IN USE.

OVER 4,000 FURNISHED THE WESTERN UNION TELEGRAPH COMPANY UP TO THIS TIME.

The Montreal Telegraph Company have adopted them, and have 2,500 now in use in their principal offices.

THEY THOROUGHLY INSULATE THE BATTERY,  
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Liberal reduction for large quantities.

A VERY SUPERIOR SCREW GLASS INSULATOR CHEAP.

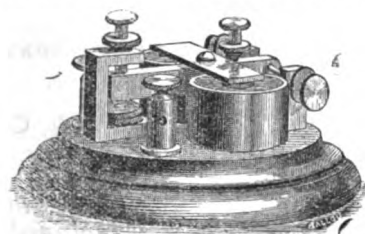
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WATTS & CO.

BALTIMORE, MD.

SEND FOR CATALOGUE.

## LITTLE MONITOR!



PRICE, \$6.00.

### Only One Cell of Local Necessary.

Is a nicely-finished little Instrument, having FULL-SIZE MAGNETS, with Polished Rubber Covers, and excels all similar Instruments for sound.

### A LITTLE MONITOR KEY TO MATCH.

A little less than ordinary size, with EXTRA LARGE PLATINAS, made of the best materials, and nicely finished, \$4.00

Both of the above Instruments sent on receipt of \$9.00.

### The Little Monitor Relay,

A beautiful working little Relay, with Double Adjustment, and encased with Polished Rubber. Price, \$11.00.

"EMPIRE SOUNDER," Best No. 1, \$7.25

"KEY," "RELAY," "SOUNDER," \$5.00

"YOUNG AMERICA" SOUNDER, \$4.50

LEARNERS' SET, a small Sounder, Key, Battery, Instruction

Book, Wire, Chemicals, Telegraph Paper, &c., 7.00 to 11.00

DANIELS' LOCAL BATTERY, with pure Zincs, that clean

white, no black scales, per cell, 1.50

GROVE BATTERY, with improved connections, per cell, 1.50

CALLAUD LOCAL, per cell, 1.50

HILL'S "KEY," 1.50

Send stamp for Illustrated Catalogue. Special prices by mail.

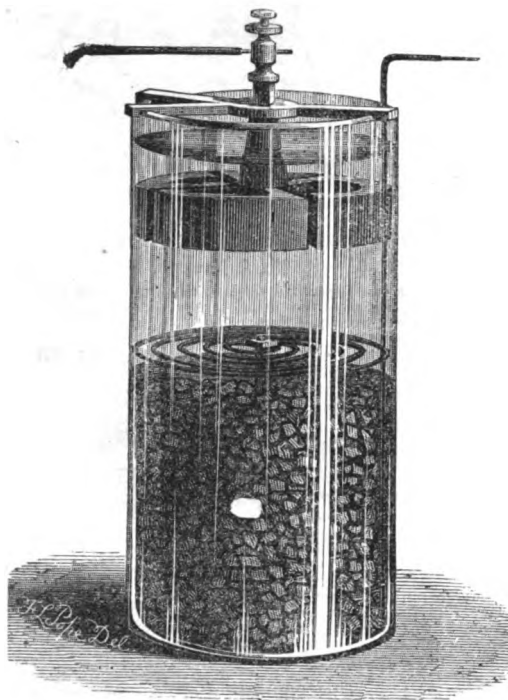
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**THE PERFECT BATTERY.**

CLEANLINESS. CONSTANCY. ECONOMY.

**THE LOCKWOOD BATTERY,**

PATENTED APRIL 8, 1873,

**L. G. TILLOTSON & CO.,** Sole Agents,

No. 8 DEY STREET, N. Y.

This Battery has been in extended practical use for more than a year, and is now acknowledged by leading Electricians in this country and Europe to be

**FAR SUPERIOR TO ALL OTHERS**

for telegraphic purposes, or closed circuits of any description. This Battery received the **FIRST PREMIUM** over all competitors for

**POWER, DURABILITY AND ECONOMY**

AT THE

**Cincinnati Industrial Exposition of 1873.**

The size shown in the cut (No. 2), when charged with 5 lbs. sulphate of copper per cell, is capable of working two or three main circuits of average length for **MORE THAN ONE YEAR**, without ANY ATTENTION whatever. The copper and zinc solutions are perfectly separated, and there is

**NO LOCAL ACTION,**

and the circuit is **ABSOLUTELY UNIFORM** at all times. It is equally well adapted for a

**LOCAL BATTERY,**

or for any purpose requiring a uniform, powerful and constant current.

The number 2 size (price \$2.50) is now ready for sale. Other styles are in preparation, and will soon be put on the market. Send for Circular.

**L. G. TILLOTSON & CO.,**

8 Dey Street, New York.

54 South Fourth St., Philadelphia.

22 West Fourth Street, Cincinnati,

**SOLE AGENTS.**

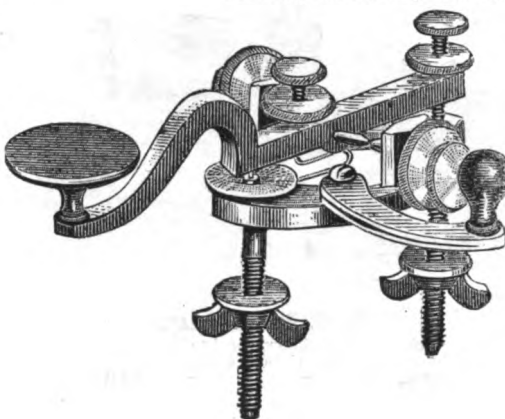
New York, Oct., 1873.

We have appointed Messrs. L. G. TILLOTSON & Co. Sole Agents for the sale of the Lockwood Battery,

**LOCKWOOD BATTERY CO.,**  
W. H. SAWYER, Secretary.

**WATTS & COMPANY,**

Baltimore, Md.,

**PATENT CIRCUIT-CLOSER KEY,**

Does not keep line closed by binding against the anvil. Slight pressure of the finger required to put lever in circuit or cut out.

**Acknowledged to be a decided Improvement.****PRICE SAME AS THE ORDINARY KEY.**

Superintendents and Purchasing Agents are invited to examine our

**EXTENSIVE FACILITIES**

for supplying the

**BEST GALVANIZED WIRE,**  
**OAK OR LOCUST SCREW PINS AND BRACKETS,**  
**CROSS ARMS,**

**BROOKS OR GLASS INSULATORS,**  
**SUPERIOR INSTRUMENTS AND BATTERIES,**

at the same prices offered by other establishments

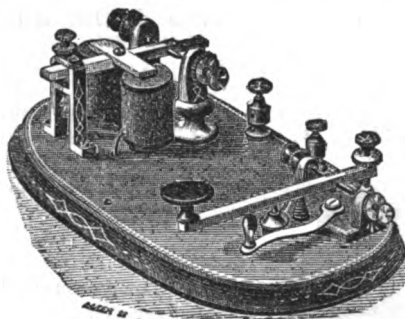
Our new

**ILLUSTRATED CATALOGUE**

contains some useful information for Superintendents and others interested in the Science of Telegraphy.

**GEO. H. BLISS & CO.,**

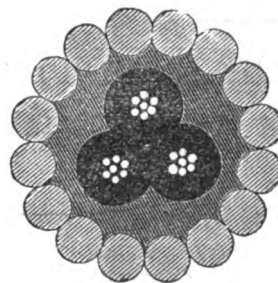
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**CHICAGO, ILL.****Private Line Instrument****Price, \$10.**

This Instrument is well finished, and gives a clear, loud sound. It is made to work on a line from a few feet to ten miles long. Give length of line in ordering Instruments. One cup of Bliss' Reservoir Battery is furnished with each Instrument.

**GEO. H. BLISS & CO.,****Chicago, Ill.****THE BISHOP GUTTA PERCHA WORKS.**

422, 424, 426 East 25th St., N. Y.

**S. BISHOP,**

PROPRIETOR,

ONLY AMERICAN MANUFACTURER

OF

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**UNITED STATES.**

Have on hand and made to order

**SUBMARINE TELEGRAPH CABLES,****INSULATED WIRES, for****TELEGRAPH AND ELECTRIC USE, and for****BLASTING AND MINING PURPOSES,**

in every variety desired

As an Insulation for Telegraph Cables and Electric Conductors **GUTTA PERCHA** has been universally adopted by all scientific and practical Electricians and Manufacturers of Telegraph Cables and Wires in this country and Europe, and has sustained, with increasing confidence in its superiority, the practical test of over twenty years' general use.

The PROPRIETOR would say to all parties desiring

**SUBMARINE TELEGRAPH CABLES,**

that he will guarantee to make and deliver at his Factory any style of Cable, Insulated with Gutta Percha, as low as they can import Cable of the same style and quality.

**ORDERS RECEIVED AT THE FACTORY.****Messrs. L. G. TILLOTSON & CO.,**

8 Dey Street, New York,

54 South 4th St., Philadelphia

22 West 4th St., Cincinnati,

have been appointed by me **GENERAL AGENTS** for the sale of any Telegraph Cable or Wire manufactured at the Works in New York, at Factory Prices, delivered in New York.

**J. H. THORNLEY, 503 Chestnut St., Philadelphia,**

has been appointed Agent for the sale of any and all goods manufactured by me, at Factory Prices, delivered in New York.

Any goods of my manufacture (except Telegraph Goods), are for sale in New York, by

**H. G. NORTON & CO., 26 Park Place,****RUBBER CLOTHING CO., 363 Broadway,****D. HODGMAN, 27 Maiden Lane,****SHEPARD & DUDLEY, 150 William St.**Address all communications to **S. BISHOP,****OFFICE AT FACTORY.**

John Polhemus, Printer, 102 Nassau, cor. of Ann Street.

# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 2.

NEW YORK, JANUARY 15, 1875.

WHOLE NO. 173.

## OCEAN TELEGRAPHY.

BY GEORGE B. PRESCOTT.

[From the *Scientific American*.]

### Number II.

The working speed of ocean cables with the mirror system is as follows:

#### NUMBER OF WORDS PER MINUTE.

Weight of copper strands, lbs.	Knots, 1,000.	Knots, 1,500.	Knots, 2,000.	Knots, 2,500.
100	18.3	8.1	4.6	2.9
150	27.5	12.2	6.9	4.4
200	37.0	16.4	9.2	5.9
250	46.0	20.4	11.2	7.4
300	55.0	24.4	14.0	8.8
350	64.1	28.5	16.0	10.3
400	73.2	32.5	18.3	11.7

The apparatus employed in the transmission of communications through ocean cables is the invention of Professor Sir William Thomson. Ampère suggested, as early as the year 1820, the employment of a galvanometer for the purpose of telegraphing, and in 1833 Gauss and Weber used a reflecting galvanometer as an indicator upon a line about one mile in length, uniting the Observatory and the Physical Cabinet at Göttingen. Their alphabet was made up of combinations of right and left deflections. This apparatus, the first ever employed for practical telegraphy, has lately, in the hands of Sir William Thomson, become the most sensitive of all telegraphic instruments. His reflecting galvanometer is the only instrument at present with which a cable 2,000 miles in length can be successfully worked by a battery of low tension. It consists of a needle formed of a piece of watch spring, three-eighths of an inch in length. The needle is suspended by a thread of cocoon silk without torsion. The needle lies in the centre of an exceedingly delicate galvanometer coil. A circular mirror of silvered glass is fixed to the needle, and reflects at right angles to it in the plane of its motion. It is so curved that, when the light of a lamp is thrown through a fine slit on it, the image of the slit is reflected on a scale about three feet off, placed a little above the front of the flame. Deflections to the extent of half an inch along any part of the scale are sufficient for one signal. In so delicate an instrument, the sluggish swing of the needle in finally settling into any position would destroy its usefulness. To rectify this, a strong magnet, about eight inches long and bent concave to the instrument, is made to slide up and down a rod placed in the line of the suspending thread above the instrument. This magnet can be easily shifted, as necessity may require. The oscillations of the needle due to itself are, by the aid of the strong magnet, made so sudden and short as only to broaden the spot of light.

The following illustration (Fig. 6) shows the construction of the instrument. The galvanometer, P, contains the multiplication wire, divided into several layers and so arranged that it can be used for weak or strong currents, according to the requirements of the instrument. In the centre of the coil the magnetic needle is suspended, to which is attached the tiny mirror, and close before it is to be found a small collective lens, whereof the focal point lies almost in the mirror, in order to produce a sharp figure of the prism on the scale.

The magnetic needle has a length of only  $\frac{1}{2}$  of an inch, a breadth of  $\frac{1}{4}$  of an inch, and a thickness of  $\frac{1}{16}$  of an inch. The mirror connected with the needle has a thickness of only  $\frac{1}{16}$  of an inch. The magnetic needle is made from a small piece of a very fine watch spring, and the little mirror, from one of the thinnest microscopic cover glasses. The magnetic needle and mirror used for signaling across the Atlantic weigh only  $1\frac{1}{2}$  grains.

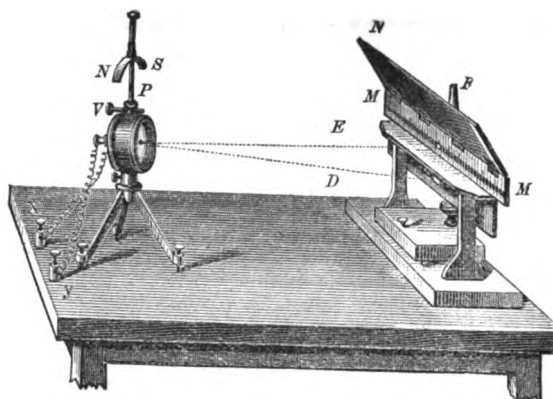


Figure 6.

The entire box which encloses these parts is hermetically closed. The ends of the multiplier wires are soldered inside the box to two screw posts, *x y*, wherewith the instrument is connected with the cable.

A curved steel magnet, N S, is fixed to a brass bar, P, in such a way that, by turning the micrometer screw, V, any required removal, upwards or downwards or to the right or left, can be given to it; and by this means the magnetic needle, when in a state of rest, is kept in such a position that the picture of the slit, D, which is reflected from the middle of the mirror, and likewise returns through the lens, appears upon the zero mark of the scale, M M.

Opposite the galvanometer, the scale, M M, and the lamp, F, are to be seen. The light from the lamp penetrates through the slit, D, in an oblique direction to the looking glass, and is thrown back from it to the scale somewhat upwards, in the direction, F', where the picture of the slit is to be seen as a fine light line. The screen, N, can be turned up and serves to keep the lamp light from the scale. The instrument is necessarily used in a darkened room.

The transmitting key is shown in Fig. 7. It con-

sists of two separate levers, L and E, moving on axes at the upper end in the figure. They are kept, by springs, pressing against the cross plate, C, which is in connection with one of the poles of the battery. L is connected with the cable and E to the earth. When either key is pressed down, it falls on the plate, Z, in connection with the other pole of the battery. In the normal position of the key, the cable is connected, through L, C, and E, to earth, and Z is insulated; and it is easy to see how a positive or negative current is put to line according as L or E is depressed.

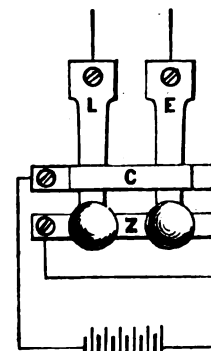


Figure 7.

The alphabet is made by opposite movements produced by one or other of the keys. The signals need not be made from zero as a starting point. The eye can easily distinguish, at any point in the scale to which the spot of light may be deflected, the beginning and the end of a signal, and when its motion is caused by the proper action of the needle or by currents. It is thus that the mirror galvanometer is adapted to cable signaling, not only by its

extreme delicacy, but also by its quickness. The deflections of the spot of light have been aptly compared to a handwriting, no one letter of which is distinctly formed, but yet is quite intelligible to the practised eye. Signals in this way follow each other with wonderful rapidity. A low speed of from twelve to sixteen words per minute is adopted for public messages; but when the operators communicate with each other, a speed of twenty-four words per minute is sometimes attained.

Condensers are used at both ends of the Atlantic cables, by means of which the speed is very considerably increased. The term condenser has long been used among electricians to denote an arrangement, in a moderate compass, equivalent to a Leyden jar of enormous capacity. It is composed of alternate layers of mica or paraffined paper and tinfoil. One coating of this Leyden jar is put in direct communication with the conductor of the cable, and the other is joined to the sending key. At the other end of the cable one coating of the condenser is connected with the cable and the other coating with the receiving instrument. The condensers are each equal to about 70 miles of the cable. The condenser serves

two purposes : it lessens the delay caused by induction, and prevents the disturbance of the signals by earth currents. The cable and condenser being insulated, there is no voltaic circuit, and no way whereby earth currents can enter and leave the line.

The question is often asked : " What is the velocity of electricity ? " or " how long does electricity take to go across the Atlantic Ocean ? " Electricity cannot properly be said to have a velocity, but differs with the circumstances under which it travels. For about two-tenths of a second after contact is made with the conductor of an Atlantic cable, no effect is perceptible on the opposite side of the ocean, even by the most delicate instrument. After four-tenths of a second, the received current is about 7 per cent. of the maximum permanent current which the battery could produce in the circuit. One second after the first contact, the current will reach about half its final strength, and after about three seconds its full strength. The current does not arrive all at once, like a bullet, but grows gradually from a minimum to a maximum.

The Direct United States Cable, which is now being laid between Ireland and Nova Scotia, and thence to Rye Beach, New Hampshire, is 3,060 nautical miles in length. The core is composed of a thick copper wire encircled by eleven very fine copper wires weighing 480 pounds per mile, and is served with four coatings of gutta percha, measuring about three eighths of an inch in diameter. After the serving with gutta percha comes a serving with manilla hemp, which brings the core up to a thickness of three-fourths of an inch ; and then follows the sheathing with iron wire, which forms the outer covering of all. Ten iron wires are employed for this purpose : but before being applied to the cable, they are each wound with five strings of manilla hemp, so as to impart greater strength, and protect them from the action of water. The hemp covered wires are served with a species of black compound resembling tar or pitch ; and after being twisted around the core, they are again served in this manner, and finally whipped with Italian hemp, which, however, can scarcely be said to do more than hold the strands in their places until the whole becomes hard and dry. This is the deep sea portion of the cable.

The shore ends are of varying sizes, graduating from about 2½ inches down to ¼ of an inch.

The Direct United States Company expect to obtain a speed of about nine words per minute, or about one half that of the present Newfoundland and Ireland cables.

The French Atlantic Cable, laid in 1869 between Brest and St. Pierre, has 400 pounds of copper per mile, is 2,584 knots in length, and has a working speed of fifteen words per minute.

The contract price of the Direct United States Cable, laid down, is \$6,055,000. The cost of the Anglo-American Cable—between Ireland and Newfoundland—laid down, was \$1,500 per mile.

The Direct United States Cable has been laid from Ireland to within a distance of about 200 miles of Nova Scotia ; but owing to unfavorable weather it had to be cut and buoyed. It will probably be recovered again as soon as favorable weather ensues, and its laying be successfully completed. When this is accomplished, there will be five working cables across the North Atlantic and one across the South Atlantic Oceans.

Submarine telegraph cables now extend across the North and South Atlantic, Indian, and German Oceans ; the Mediterranean, Red, North, Baltic, Chinese, Oriental, Japan, Java, and Caribbean Seas, the Gulfs of Biscay, Bengal, Mexico, and St. Lawrence, and the Straits of Bass and Malacca ; thus

placing North and South America, the West Indies, Europe, India, Java, Australia, Tasmania and Siberia in constant and instantaneous telegraphic communication, as well as affording communication with the most important ports in China and Japan.

The following is a list of the more important cables which are in working order at the present time :

Date.	From	Length in Miles.
1851.	Dover, England, to Calais, France	25
1852.	Holyhead, Wales, to Howth, Ireland	65
	Port Patrick, Scotland, to Donaghadee, Ireland	25
	Prince Edward Island to New Brunswick	12
1853.	Denmark, across the Belt	18
	Dover, England, to Ostend, Belgium	80½
	Port Patrick, Scotland, to Donaghadee, Ireland	25
1854.	Port Patrick, Scotland, to Whitehead, Ireland	27
	Sweden to Denmark	12
	Holyhead, Wales, to Howth, Ireland	65
1856.	Prince Edward Island to New Brunswick	1
	Crete or Candia to Syra, Greece	170
	St. Petersburg to Cronstadt, Russia	10
	Across the Amazon	106
1857.	Ceylon to Hindostan	30
	Norway across the Fjords	49
1858	England to Holland	140
1859.	Denmark to Heligoland	46
	Isle of Man to Whitehaven, England	36
	Sweden to Gottland	64
	Folkestone, England, to Boulogne, France	24
	Malta to Sicily	60
	Jersey to Piron, France	21
1860.	Great Belt, Denmark (two cables)	14
	Cape St. Martin, Spain, to Iviza	76
	Iviza to Majorca	74
1861.	Corfu to Otranto, Italy	90
	Dieppe, France, to Newhaven, England	80
1862.	Wexford, Ireland, to Aberman, Wales	63
	Lowestoft, England, to Zandvoort, Holland	125
1864.	Fao, Persia, to Bushire, Persia	204
	Bushire, Persia, to Masandam, Persia	450
	Masandam, Persia, to Gwadar, Beloochistan	447
	Gwadar, Beloochistan, to Kurrachee, British India	346
	Otranto, Italy, to Avlona, Turkey	50
1865.	Trelleborg to Rugen, Germany	55
	South Foreland, England, to Cape Grienez, France	25
1866.	Ireland to Newfoundland	1,896
	Lyall's Bay to White's Bay	41
	Crimea to Circassia	40
	Colonla to Buenos Ayres	30
	England to Hanover	224
	Cape Ray, Newfoundland, to Aspee Bay, Cape Breton	91
	Leghorn, Italy, to Corsica	65
	Persian Gulf	160
1867.	South Foreland England, to La Panne, Belgium	47
	Malta to Alexandria, Egypt	925
	Placentia, Newfoundland, to St. Pierre	118
	St. Pierre to Sydney, Cape Breton	126
	Arendal, Norway, to Hirtshals, Denmark	68
1868.	Italy to Sicily	5
	Havana to Key West, Florida	125
1869.	Peterhead, Scotland, to Egersund, Norway	250
	Grisselhamm, Sweden, to Nystadt, Russia	96
	Newbiggin to Sondervig	334
	Malta to Sicily	54
	Tasmania to Australia	176
	Sicily Isles to Land's End, England	27
	Ithaca to Cephalonia	7
	Bushire, Persia, to Jask, Beloochistan	505
	Brest, France, to St. Pierre	2,584
	St. Pierre to Duxbury, U. S.	749
	Moen to Bornholm, Sweden	80
	Bornholm, Sweden, to Libau	230
1870.	Scotland to Orkney Isles	37
	Salcombe, England, to Brignozan, France	101
	Beachy Head, England, to Cape Antifée, France	70
	Suez, Egypt, to Aden, Arabia	1,460
	Aden, Arabia, to Bombay, India	1,818
	Portcurno, England, to Lisbon, Portugal	823
	Lisbon to Gibraltar	331
	Gibraltar to Malta	1,120
	Marseilles, France, to Bona, Africa	447
	Bona, Africa, to Malta	386
	Madras to Penang	1,408
	Penang to Singapore	400
	Singapore to Batavia	557
	Malta to Alexandria, Egypt	904
	Batabano, Cuba, to Santiago, Cuba	520
	Jersey to Guernsey, Channel Islands	16
	Guernsey to Alderney, " "	18
	Santa Maura to Ithaca	7
	Zante to Trepito	11
	Suntum to Thermia	25
	Patras, Greece, to Lepanto	2
	Dartmouth, England, to Guernsey	66
	Guernsey to Jersey	15
	Port Rico to St. Thomas	110
	Santiago, Cuba, to Jamaica	140
	Port Patrick, Scotland, to Donaghadee, Ireland	25
	Anjer, Java, to Telok Betong, Sumatra	55
	Banjoewangie, Java, to Port Darwin, Australia	1,082
	St. Thomas to St. Kitts	133
	St. Kitts to Antigua	90
1871.	Javea to Iviza, Balearic Islands	53
	Majorca to Minorca	35
	Villa Real to Gibraltar	155
	Marseilles, France, to Algiers, Africa	447
	Singapore to Saigon, Cochinchina	620
	Key West to Punta Rassa	120
	Saigon to Hong Kong	975
	Hong Kong to Shanghai	1,100
	Shanghai, China, to Nagasaki, Japan, thence to Wladivostock, Siberia	1,200
	Rhodes to Marmarice	22
	Latakia to Cyprus	86
	Samos to Scala Nuova	11
	Mytilene to Aivali	13
	Khania to Retimo	32
	Rhetime to Candia	41
	Candia to Rhodes	201
	Chios to Cheesmech	6
	Zante to Corfu	150
	Zante to Cephalonia	18
	Lowestoft, England, to Greitsell, Germany	223
	Antigua to Demarara, connecting the West India Windward Islands	1,028
	Porto Rico to Jamaica	582
1872.	Lizard, England, to Bilbao, Spain	460
	British Columbia to Vancouver Island	18
1873.	Falmouth, England, to Lisbon, Portugal	1,150
	Calthness to Orkney	8
	Valencia to Newfoundland	1,900
	Key West to Havana	100
	Placentia, Newfoundland, to Sydney, Cape Breton	300
	Heligoland to Cuxhaven, Germany	40
	England to Denmark	450
	France to Denmark	550
	Denmark to Sweden	10
	Pernambuco, Brazil, to Para, Brazil	1,382
	Alexandria, Egypt, to Candia or Crete	390
	Candia to Zante	240
	Zante to Otranto, Italy	190
	Alexandria, Egypt, to Brindisi, Italy	930
1874.	Lisbon, Portugal, to Madeira, Madeira Islands	633
	Madeira to St. Vincent, Cape de Verde Islands	1,360
	St. Vincent to Pernambuco, Brazil	1,983
	Jamaica to Colon, South America	660
	Pernambuco, Brazil, to Bahia, Brazil	450
	Bahia, Brazil, to Rio Janeiro	1,240
	Italy to Sicily	7
	Jamaica to Porto Rico	582
	Rio Janeiro to Rio Grand do Sul	840
	Rye Beach, U. S., to Tor Bay, Nova Scotia	550
	Barcelona, Spain, to Marseilles, France	200
	Shetland to Orkney	60
	Valencia to Newfoundland	1,900

The following is a list of the principal submarine telegraph companies, with the amount of their capital :—

Anglo-American Telegraph Company : Ireland to Newfoundland ; Newfoundland to Cape Breton ; Brest to St. Pierre ; St. Pierre to Duxbury, U. S. (five cables)—\$35,000,000.

Brazilian Submarine Telegraph Company : Portugal to Brazil—\$6,500,000.

Cuba Submarine Telegraph Company : Santiago to Havana—\$800,000.

Direct Spanish Submarine Telegraph Company : England to Bilbao, Spain—\$650,000.

Direct United States Submarine Telegraph Company : Ireland to Nova Scotia ; Nova Scotia to the United States—\$6,500,000.

Eastern Submarine Telegraph Company : England to Bombay via Mediterranean and Red Sea—\$15,000,000.

Eastern Extension, Australian and China Subma-

rine Telegraph Company: Madras to China and Japan; Java to Australia—\$8,315,500.

Great Northern of Copenhagen Telegraph Company: England to Denmark, Norway, Sweden and Russia—\$2,000,000.

Great Northern China and Japan Extension: Siberia to Hong Kong and Japan—\$3,000,000.

International Ocean Telegraph Company: Florida to Havana—\$1,500,000.

Mediterranean Extension Telegraph Company: Sicily to Malta and Corfu—\$760,000.

Montevideo and Brazilian Telegraph Company: Montevideo to Brazilian Frontier—\$875,000.

Platino-Brazilian Telegraph Company: Rio Janeiro to Uruguay—\$2,000,000.

Submarine Telegraph Company: England to France, to Belgium, and to Holland—\$2,093,200.

Western and Brazilian Telegraph Company: Coast of Brazil—\$6,750,000.

West India and Panama Telegraph Company: Cuba to West India Islands and South America—\$9,500,000.

### ON THE EFFECT OF ACID ON THE INTERIOR OF IRON WIRE.

By Professor OSBORNE REYNOLDS, M. A.

It will be remembered that at a previous meeting of this society, Mr. Johnson exhibited some iron and steel wire in which he had observed some very singular effects produced by the action of sulphuric acid. In the first place the nature of the wire was changed in a marked manner, for although it was soft charcoal wire it had become short and brittle; the weight of the wire was increased; and what was the most remarkable effect of all was that when the wire was broken and the face of the fracture wetted with the mouth, it frothed up as if the water acted as a powerful acid. These effects, however, all passed off if the wire were allowed to remain exposed to the air for some days, and if it were warmed before the fire, they passed off in a few hours.

By Mr. Johnson's permission, I took possession of one of these pieces of wire and subjected it to a further examination, and from the result of that examination I was led to what appears to me to be a complete explanation of the phenomena. I observed that when I broke a short piece from the end of the wire the two pieces of the fracture behaved very differently—that on the long piece frothed when wetted and continued to do so for some seconds, while that on the short piece would hardly show any signs of froth at all. This seemed to imply that the gas which caused the froth came from a considerable depth below the surface of the wire, and was not generated on the freshly exposed face. This view was confirmed when on substituting oil for water I found the froth just the same. These observations led me to conclude that the effect was due to hydrogen, and not to acid, as Mr. Johnson appeared to think, having entered into combination with the iron during its immersion in the acid, which hydrogen gradually passed off when the iron was exposed. It was obvious, however, that this conclusion was capable of being further tested. It was clearly possible to ascertain whether or not the gas was hydrogen, and whether hydrogen penetrated iron when under the action of acid. With a view to do this I made the following experiments:

First, however, I would mention that after twenty-four hours I examined what remained of the wire, when I found that all appearance of frothing had vanished and the wire had recovered its ductility, so much so that it would now bend backwards and for-

wards two or three times without breaking, whereas on the previous evening a single bend had sufficed to break it. I then obtained a piece of wrought iron gas pipe, 6 in. long and  $\frac{5}{8}$  in. external diameter, and rather more than  $\frac{1}{8}$  in. thick; I had this cleaned in a lathe both inside and outside; over one end I soldered a piece of copper so as to stop it, and the other I connected with a glass tube by means of india-rubber tubes. I then filled both the glass and iron tubes with olive oil and immersed the iron tube in diluted sulphuric acid which had been mixed for some time and was cold. Under this arrangement any hydrogen which came from the inside of the glass tube must have passed through the iron. After the iron had been in the acid about five minutes small bubbles began to pass up the glass tube. These were caught at the top and were subsequently burned and proved to be hydrogen. At first, however, they came off but very slowly, and it was several hours before I had collected enough to burn. With a view to increase the speed I changed the acid several times without much effect until I happened to use some acid which had only just been diluted and was warm; then the gas came off twenty or thirty times as fast as it had previously done. I then put a lamp under the bath and measured the rate at which the gas came off, and I found that when the acid was on the point of boiling as much hydrogen was given off in five seconds as had previously come off in ten minutes, and the rate was maintained in both cases for several hours. After having been in acid some time the tube was taken out, well washed with cold water and soap so as to remove all trace of the acid; it was then plunged into a bath of hot water, upon which gas came off so rapidly from both the outside and inside of the tube as to give the appearance of the action of strong acid. This action lasted for some time, but gradually diminished. It could be stopped at any time by the substitution of cold water in place of the hot, and it was renewed again after several hours by again putting the tube in hot water. The volume of hydrogen which was thus given off by the tube after it had been taken out of hot acid was about equal to the volume of the iron. At the time I made these experiments I was not aware that there had been any previous experiments on the subject; but I subsequently found, on referring to Watt's "Dictionary of Chemistry," that Cailletet had in 1868 discovered that hydrogen would pass into an iron vessel immersed in sulphuric acid. See *Comp. Rend.* lvi, 847. The facts thus established appear to afford a complete explanation of the effects observed by Mr. Johnson.

In the first place, with regard to the temporary character of the effect, it appears that hydrogen leaves the iron slowly even at ordinary temperatures—so much so that after two or three days' exposure I found no hydrogen given off when the tube was immersed in hot water. With regard to the effect of warming the wire—at the temperature of boiling the hydrogen passed off 120 times as fast as at the temperature of 60°. Also when the saturated iron was plunged into warm water the gas passed off as if the iron had been plunged into strong acid; so that we can easily understand how the hydrogen would pass off from the wire quickly when warm, although it would take long to do so at the ordinary temperatures. With regard to the frothing of the wire when broken and wetted, this was not due, as at first sight it appeared to be, simply to the exposure of the interior of the wire, but was due to warmth caused in the wire by the act of breaking. This was proved by the fact that the froth appeared on the sides of the wire in the immediate neighborhood of the fracture, when these were wetted, as well as

the end; and by simply bending the wire it could be made to froth at the point where it was bent. As to the effect on the nature and strength of the iron, I cannot add anything to what Mr. Johnson has already observed. The question, however, appears to be one of very considerable importance, both philosophically and in connection with the use of iron in the construction of ships and boilers. If, as is probable, the saturation of iron with hydrogen takes place whenever oxidation goes on in water, then the iron of boilers and ships may at times be changed in character and rendered brittle in the same manner as Mr. Johnson's wire, and this, whether it can be prevented or not, is at least an important point to know, and would repay a further investigation of the subject.

### THE VALUE OF FOREIGN COINS.

WASHINGTON, Jan. 1.—The following circular has been issued from the Treasury Department:

THE TREASURY DEPARTMENT,  
WASHINGTON, D. C., Jan. 1, 1875.

The first section of the Act of March 3, 1873, provides "that the value of foreign coin, as expressed in the money of account of the United States, shall be that of the pure metal of such coin of standard value," and that "the values of the standard coins in circulation of the various nations of the world shall be estimated annually by the Director of the Mint, and be proclaimed on the first day of January by the Secretary of the Treasury." The estimate of values contained in the following table has been made by the Director of the Mint, and is hereby proclaimed in compliance with the above stated provisions of law:

Country.	Monetary Unit.	Standard.	Value in U. S. Money.
Argentina Republic..	Peso fuerte.....	Gold.....	\$1.00
Austria.....	Florin.....	Silver.....	.45 3
Belgium.....	Franc.....	Gold & silver.....	.19 3
Bolivia.....	Dollar.....	Gold & silver.....	.96 5
Brazil.....	Milreis of 1,000 reis.....	Gold.....	.54 5
British possessions in North America. }	Dollar.....	Gold.....	1.00
Bogota.....	Peso.....	Gold.....	.91 2
Central America.....	Dollar.....	Silver.....	.91 8
Chili.....	Peso.....	Gold.....	.91 2
Cuba.....	Peso.....	Gold.....	.92 5
Denmark.....	Crown.....	Gold.....	.26 8
Ecuador.....	Dollar.....	Silver.....	.91 8
Egypt.....	Pound of 100 piasters.....	Gold.....	4.97 4
France.....	Franc.....	Gold & silver.....	.19 3
Great Britain.....	Pound Sterling.....	Gold.....	4.86 4
Greece.....	Drachma.....	Gold & silver.....	.19 3
German Empire.....	Mark.....	Gold.....	.23 8
Hayti.....	Dollar.....	Silver.....	.95 2
Japan.....	Yen.....	Gold.....	.99 7
India.....	Rupce of 16 annas.....	Silver.....	.43 6
Italy.....	Lira.....	Gold & silver.....	.19 3
Liberia.....	Dollar.....	Gold.....	1.00
Mexico.....	Dollar.....	Silver.....	.99 8
Netherlands.....	Florin.....	Silver.....	.85 5
Norway.....	Crown.....	Gold.....	.26 8
Paraguay.....	Peso.....	Gold.....	1.00
Peru.....	Dollar.....	Silver.....	.91 8
Porto Rico.....	Peso.....	Gold.....	.92 5
Portugal.....	Milreis of 1,000 reis.....	Gold.....	1.08 4
Russia.....	Rouble of 100 copecks.....	Silver.....	1.00
Sandwich Islands.....	Dollar.....	Gold.....	.19 3
Spain.....	Peseta of 100 centimes.....	Gold & silver.....	.26 8
Sweden.....	Crown.....	Gold.....	.19 3
Switzerland.....	Franc.....	Gold & silver.....	.26 8
Tripoli.....	Mahbub of 20 piasters.....	Silver.....	.11 8
Tunis.....	Piaster of 16 caroubes.....	Silver.....	.04 3
Turkey.....	Piaster.....	Gold.....	.91 8
U. S. of Columbia.....	Peso.....	Silver.....	.94 9
Uruguay.....	Patacon.....	Gold.....	....

B. H. BRISTOW,

Secretary of the Treasury.



## CORRESPONDENCE.

PORTLAND, Jan. 9th, 1875.

*To the Editor of the Journal of the Telegraph:*

I have been looking over two or three complaints of errors which lie upon my desk, each of which are of a class which it is difficult to place upon the sender or receiver. This leads me to the reflection that there is, or ought to be, some way to provide in a measure at least against this liability to error, and there is one point I will mention. A batch of messages is put on the desk of a sender, and before he is through, another batch, and so on through the busy hours. The sender, anxious to reduce his pile, and to get off his business, glances at the messages as he takes them up one after another, and rattles them off as he reads them rapidly. He has no opportunity for previous examination, and unless there is something very much out of the way, there is seldom a stoppage to examine or to inquire. Now, we expect and require clerks to carefully read messages when handed in for transmission; why should not the sending operators also be required to do the same? It may be said that they are, but are they in practice? Watch any circuit when there is but little let up, and note how rapidly each message succeeds the other, and, taking the average penmanship of the daily messages left for transmission, what wonder is it that words are read wrong, in the haste with which they are looked at? I have been watching this thing for some time, and I say it deliberately, that the majority of these errors are made by the operators on the busy wires, and by those who aspire to be called first-class, and who indignantly scout the idea that they could make a mistake. Yet when we investigate we find that both the sender and receiver are the "best men in the office"—are put on that circuit on account of their expertness or long service, or carefulness, &c., &c. I have made up my mind that the old doctrine, that the receiver is mostly at fault, is wrong, and that as many errors are made in hasty reading as in receiving. One great reason also of errors is the fear of being called a "plug," which is felt more or less by all operators, whether they own it or not. For instance, let the duplex sender stop and read over each message carefully, the receiver would be very likely to inquire what's the matter? Put somebody there who can send, or some other not complimentary remarks, not relished usually by operators. There is a pride in sending and receiving without breaking, which is very pardonable; but no operator, whether receiver or sender, has any right to guess or to be uncertain of any word, but should "hold up" or break, when there is any chance of uncertainty.

I have scratched down these ideas as they passed through my mind, and will forward them to you in the hope that you will say something in the JOURNAL, which may bring the matter forcibly to the attention of all, as we are all certainly vitally interested.

J. S. BEDLOW, *Sup't.*

DENNISON, O., Dec. 24, 1874.

*To the Editor of the Journal of the Telegraph:*

From this office to Uhrichsville is a full mile; tariff book gives us 25 cents for delivery of business to Uhrichsville, but full half of the offices in taking messages for Uhrichsville do not collect for delivery. In such cases should I notify sending office to do what tariff book requires, and hold message until charges are paid or guaranteed, or run the risk of having to pay the messenger myself if he fails to collect on delivery? Please answer through JOURNAL,

as this has been a vexed and vexatious question to several offices similarly situated.

G. L. LANG.

*Answer.*—The message should not be held, but delivered promptly. If you fail to collect the delivery charges the amount should be checked against the sending office, you taking credit as paid other lines. The sending office failing to observe the regulations becomes responsible for the charges involved by this negligence. No service message should be sent, but it might be well to notify the office by postal card.

CINCINNATI, O., Dec. 31, 1874.

*To the Editor of the Journal of the Telegraph:*

Red message from Memphis reads: "Telegraph lowest shoulder, crib and clear, fifteen, twenty days, salt." The check 10 words. There is not a cypher word in the message. "Crib" is an abbreviation of "Clear Rib." Should it be allowed to pass as one word?

B. H. JOHNSON.

*Answer.*—It should not be assumed that a word means anything else than it expresses. Crib is one word only.

SWANCREEK, Dec. 24, 1874.

*To the Editor of the Journal of the Telegraph:*

Will you please answer, in the JOURNAL, how to make three machines work together. They are short line instruments—two Geo. H. Bliss's Amateurs' Tel. Apparatus, and one of W. R. Baldwin's Coöperative Instruments. I have got two going all right, and want to put one more between them, if it can be done.

*Answer.*—Cut the wire which connects the two instruments together. Put one of the ends in one of the binding screws of the third instrument, and the other end in the other binding screw.

*To the Editor of the Journal of the Telegraph:*

1st. Suppose A. in New York sends B. in Philadelphia a message checked "D. H. pass." A., whose place of business is New York and residence Brooklyn, tells B. to answer to Brooklyn? Am I bound to send the answer D. H.?

2d. Should answers to D. H.'s be sent D. H. or collect?

3d. Suppose a party wants to send a message D. H. to a party holding a pass, am I bound by the rules of the Company, or have I the right or privilege to send it D. H.?

JUSTICE.

*Answer.*—1. Yes. 2. They should be sent free unless they are answers to messages covered by complimentary stamps, and upon which the replies have not been prepaid by additional stamps. 3. No messages should be sent free except those covered by franks. This embraces messages sent by holders of franks and answers thereto. You have no right nor privilege to act contrary to this or any other of the regulations of the Company.

**A NOTE ON ELECTRO-MAGNETS.**—*M. Deleuil.*—It was desirable to substitute for the permanent magnet (used to extract iron particles from the paste or dough of unmanufactured porcelain) an electro-magnet, so arranged that the liquids contained in the paste into which the magnet has to be plunged should not penetrate into the coil. A magnet was devised as follows:—A hollow coil was enclosed in a covering of sheet iron whose interior diameter was just large enough to allow the introduction of the coil. The iron paring and chippings contained in the paste are found to attach themselves to it in great abundance, and suits the purpose admirably.

## ELECTRO MUSIC.

A correspondent, Dr. G. P. Hachenberg, calls the attention of the *Scientific American* to his plan for playing one or more pianos by electricity, and suggests, among other remarks, that instruments thus arranged might prove an interesting feature in the coming Centennial Exhibition. Dr. Hachenberg says: "The electrical union of ten pianos is a very simple arrangement, but is controlled with singular effect to render volume and expression. One instrument serves to play upon, and the rest are connected with it by electro magnetic attachments, so that the pressure of a certain key on the key piano determines the striking of nine other like keys on the rest of the instruments. The pedals are governed by similar arrangements, and there is an apparatus whereby the music may be played upon as many or as few of the ten pianos as desired.

The invention is not unpractical; and in fact, a similar contrivance is in use upon the two organs of St. Thomas' Church, in this city, where the tower bells are also chimed in connection with the organs by electricity. It suggests possibilities of future musical performances quite interesting. There is no reason, for example, why pianos, minus key-boards, should not be provided in houses, and their works connected with the key-boards of three or four instruments, say in a central office. In the latter, at certain hours of the day and night, celebrated performers might be engaged to play, one, for example, executing classical, another sacred, another operatic, and a fourth dancing music, on as many separate pianos. These last could all be connected with any number of piano movements all over a city, so that the playing of one instrument in the central bureau would, of course, be repeated on every other piano, no matter how many or how widely separated, and the effect would be exactly as if the performer were individually in the parlor of every subscriber. The latter might be provided with a printed daily programme, specifying that at such and such an hour Signor So-and-So would play certain music; Monsieur Somebody Else some other kind, and so on. The subscriber then watches his clock, and at the specified hour turns a switch on his wall, which places his instrument in connection with either Monsieur's or the Signor's piano. Then all he has to do is to listen until he gets tired, when, without apologizing to the eminent performer, he shuts him up by a touch of the finger on a button.

**FORCE OF ELECTRICAL DISCHARGES.**—The theory that the splitting of the trunks of trees by lightning is the result of the sudden evaporation of the liquids contained within them has received much confirmation from experiments made by Osborn Reynolds, who succeeded in splitting small sticks of wood by passing the electric spark through them, after they had been impregnated with water. He also burst small glass tubes which were filled with water, although the same tubes, when empty, allowed the electric spark to jump through them without in the least disturbing them. The most striking experiment made by him was upon a tube three-eighths of an inch exterior and one-eighth interior diameter, which could stand a pressure of at least 200 atmospheres to the square inch; this tube was fourteen inches long and bent at a right angle. A very large electric flash being sent through the tube, it was split by the first discharge, and the pieces thrown to a distance of several feet. The inner surface of the tube was, in fact, completely pulverized, as though it had been struck by a hammer. Mr. Reynolds estimates that the pressure must have been more than 1,000 atmospheres.



### QUADRUPLIX TELEGRAPHY TO BE INTRODUCED IN SAN FRANCISCO.

THE Western Union Telegraph Company are about to introduce the new quadruplex system of telegraphy on the circuit between San Francisco and Virginia City. This system is yet hardly two months old, but it has already been demonstrated a complete success. The old system of telegraphy allowed a single Morse wire, in a lively circuit, to average per hour about forty messages, of twenty words each. A message going one way or the other occupied the wire to the exclusion of every other message. The duplex system was inaugurated by the Western Union Company two years ago last February. This doubled the capacity of a wire, and allowed two messages to be sent over it simultaneously, increasing its capacity to an average of eighty messages an hour.

A short time ago the quadruplex system was put into operation between New York and Boston, and was found to do work admirably. This quadruples the transmitting capacity of the single wire, and allows four messages to be sent over it simultaneously. As a conclusive test of its merits, it was then tried on the New York and Chicago circuit. The test was made while it was raining in New York, and consequently the weather was not the best for a brilliant trial; but the value of the quadruplex system will be readily inferred when we state that *there were sent and received, simultaneously over a single wire, two hundred and thirty-three messages in one hour.* The messages sent and received were such as constitute the every-day business of the Western Union offices, and, supposing them to average twenty words each, we have an aggregate of *four thousand six hundred and sixty words over a single wire in sixty minutes*—a wonderful achievement in telegraphy. It is probable that none of the circuits in the country will be found too long for the use of the quadruplex system.

Another valuable feature of the system is this: Supposing it to be used on the San Francisco and Omaha circuit, the Ogden operators can use the wire in either direction, providing it is not carrying its full load. One or two messages coming from any one way will allow the Ogden operators to use it for the transmission of a single message, or two messages simultaneously, in an opposite direction. The inventors of the system are George B. Prescott, Electrician of the Western Union Company, New York, and T. A. Edison, Electrician, also of New York. The invention is said to be worth more to the Company than the wires it displaces or represents. The interest, taxes and maintenance of every mile of the Company's wire is estimated at \$8 per annum. The quadruplex system makes one wire do the work of four, and the saving to the Company in this respect can be easily calculated from the fact that at the close of the year, June 30th, the Company had in operation 71,585 miles of line and 175,135 miles of wire. Between New York and Chicago alone the use of the quadruplex upon one wire will afford such extra facilities as could only be secured to the Company by the erection of additional wires, whose simple repairs, to say nothing about the original cost, interest or taxes, would cost the Company \$25,000 annually. The benefit which the public will experience from the improvement will probably come before long in the shape of a reduced tariff.

The duplex system has long been in successful operation between this city and Chicago, and upon the stock wires between here and Virginia City. As the stock messages require quick work, as they generally are rushed in at the last moment before the

Board meets, Superintendent Gamble has ordered the quadruplex for this circuit, which will enable the Company to put through one or two hundred messages an hour.—*San Francisco Bulletin.*

### THE RESPONSIBILITY OF RAILROAD TELEGRAPH OPERATORS.

In the Court of Quarter Sessions, at Jersey City, on Jan. 12th, John S. McClelland, a telegraph operator on the Pennsylvania Railroad at the Bergen cut, was placed on trial on an indictment for manslaughter. The indictment set forth that the defendant, on the 28th of March last, neglected to warn the conductor of a train to remain at one end of the cut until another had passed. Owing to this negligence two trains collided, and Robert Keyes, conductor of train 941; William Day, a fireman, and Charles Stockton, a brakeman, were killed. The prisoner was sworn in his own behalf, and testified that when he discovered his mistake he rushed out and tried to attract the attention of those on one of the trains, but did not succeed. He stated that the brakeman, Stockton, was intoxicated, and he tried to rouse him up while he was in the telegraph office. He cast the blame on McGuire, the conductor of one of the trains, for repeatedly disregarding the notifications of the telegraph operator. Gibbon Morris, the night telegraph operator at the same place, corroborated the testimony of the prisoner with regard to McGuire's repeated violation of instructions. He said he knew McGuire to run his train frequently on the main line without orders. When the defense was closed McGuire was called to give rebutting testimony, and he stated that McClelland gave him no orders whatever to remain for another train. His train was ready to proceed for Jersey City before he went to McClelland for orders. He did not hear the latter call or whistle, or motion for the train to stop. James Smathers, the engineer, testified that he heard McClelland tell McGuire that all was right, and McGuire turned the switch to let the train on the main track. The case was summed up, and the jury, after a long deliberation, found the prisoner guilty. McClelland is still out on bail.

### TELEGRAPH BILLS IN CONGRESS.

On Jan. 12th a bill was introduced in the House by Representative McCrary, of Iowa, to amend the Telegraph Law of 1866. The bill provides that all Telegraph Companies in the United States shall mutually interchange messages and transmit and deliver them at the regular tariff rates of each company between the points of transmission, without any additional charge for words indicating the route or manner of transmission, and punishes by fine, not exceeding \$2,000, or imprisonment, not exceeding two years, and by liability for damages to the party injured, any officer or employé of any Telegraph Company who shall refuse to receive or who shall fail promptly to transmit and deliver messages at the rates and in all respects in the manner above provided.

On the same day a bill was introduced by Representative White, of Alabama, for cheapening telegraphic communication, &c., which provides that the rate for telegraphing upon every telegraph line in the United States shall be for 20 words or less, under 200 miles, 30 cents; under 500 miles, 50 cents; under 750 miles, 75 cents; under 1,000 miles, \$1, and for all greater distances, \$1.25. For night telegrams, under 1,000 miles, 30 cents; for all greater distances, 50 cents; for transmitting special telegrams to newspapers and commercial news associations, for each 100 words, for each circuit of 250

miles, not exceeding 75 cents at night and \$1 during the day; for copies of the same telegraph dropped off at one or more offices, not exceeding 50 cents at night or 75 cents during the day; for special telegrams for two or more newspapers, 10 cents additional for each 100 words for manifolded; no charge for telegrams for press associations or special telegrams to exceed those now paid by the New York Associated Press or similar associations. The bill also provides that where the lines of the competing Telegraph Companies extend over the same territory and afford equal facilities, all Government business shall be equally divided between them.

Both bills were referred to the House Judiciary Committee, which has in turn referred them to a sub-committee consisting of Messrs. Butler, of Massachusetts; Wilson, of Indiana, and Finck, of Ohio.

THERE is a great tendency to ridicule that which we do not understand. Fortunately the scientific man has the laugh on his side. He gains much more amusement from the ignorance of the unscientific than the unscientific, though in the majority, do from the hard names, queer subjects and petty minutiae which apparently monopolize the times of the physicist.—*W. H. Preece.*

### FOREIGN ITEMS.

At the meeting on Thursday, December 17, 1874, of the Western and Brazilian Telegraph Company, the directors' report, which is of an encouraging nature, was adopted. The chairman was enabled to make the welcome announcement that, in the short time which has elapsed since the making up of the accounts, the receipts have been so satisfactory as to enable the directors to declare an interim dividend at the rate of 5 per cent. per annum for the three months ending the 31st of December, payable on and after the 15th instant.

THE number of messages sent during the month of November, 1874, over the Cuba Submarine Telegraph, was 1,621, estimated to produce about £1,800, as against 817 messages, which produced £927, in the corresponding month of 1873.

THE directors of the Brazilian Submarine Telegraph Company have declared an interim dividend for the quarter ending 30th September last of 2s. 6d. per share, or 5 per cent. per annum, free of income tax, and payable on Thursday, the 24th inst. The books of the company will be closed from the 14th to the 19th of December, both days inclusive.

THE Black Sea Telegraph Company state that telegraph communication has now been established between Constantinople and Odessa, and the Odessa offices are connected by wires with the Russian land lines.

THE traffic receipts of the Direct Spanish Telegraph Company for November, 1874, were £1,224 10s., against £1,386 11s. 8d. in October.

THE traffic receipts of the Eastern Extension, Australia and China Telegraph Company, for the month of November, 1874, amounted to £17,728, against £17,454 for the corresponding period of 1873.

THE Eastern Telegraph Company's traffic receipts for the month of November, 1874, were £33,060, against £35,096 in the corresponding month of 1873.

THE Eastern Extension, Australasia and China Telegraph Company, have declared an interim dividend for the quarter ending September 30th, of 3s. per share, or 6 per cent. per annum.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
145 Broadway, New York, January 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Cooper, Ala., re-opened, square 286.  
Greensboro, Ala., re-opened.  
Argenta, Ark., closed.  
Hall's Gulch, Col., changed to Hall Valley.  
Indian Creek, Ill., changed to Wedron.  
Mechanicsburg, Ill., changed to Buffalo.  
The P. O. A. of Morton, Cook Co., Ill., is Morton Grove, instead of Niles Centre, as given in tariff book.  
Richmond, Ill., closed.  
Ellsworth, Ind., closed.  
Salem, Ind., square 272, printed in the tariff book, is in Washington Co.  
Augusta, Ind., re-opened, square 281.  
Aurelia, Iowa, closed.  
Vienna, Rush Co., and P. O., Ind., changed to Glenwood.  
Valley Junction, Iowa, closed.  
Kingsville, Kas., closed.  
Park's Fort, Kas., changed to Trego.  
New Baltimore, Mich., should read New Baltimore Village.  
Vermont, Mo., closed.  
Three Bridges, N. J., re-opened, square 53, check direct.  
Franklin, Essex Co., N. J., closed.  
Sprakers, N. Y., closed.  
The office at Sharon Springs, N. Y., is open permanently. It is given incorrectly in tariff book as a Summer office.  
Belleville, O., closed.  
Frenchman's Bay, Ont., closed.  
Adamsburg, Snyder Co., Pa., closed.  
Beavertown, Pa., closed.  
Business for Lansford, Pa., will hereafter be checked by Hauto McClure, Snyder Co., Pa., closed.  
Middleburg, Snyder Co., Pa., closed.  
P. Inter, Midlin Co., Pa., closed.  
Sellin's Grove, Pa., closed.  
ring Creek, Pa., closed.  
Millett's Sta., S. C., closed.  
Half-rate messages may be taken for and received from Mt. Juliet and Lebanon, Tenn.

## NEW OFFICES.

304 Newberne, Ala.  
304 Scott Sta., Ala.  
566 Hall Valley, Col. (formerly Hall's Gulch), P. O. Grant.  
\* Baltimore Junction, Ill., 25 2 307 Chicago, Ill.  
\* Kingston, Ill., 25 2 307 " "  
817 Wedron, Ill. (formerly Indian Creek).  
837 Buffalo, Ill. (formerly Mechanicsburg).  
\* Albion, Ind., 65 4 307 Chicago, Ill.  
\* Avilla, Ind., 65 4 307 " "  
\* Bremen, Ind., 55 4 307 " "  
\* Cromwell, Ind., 55 4 307 " "  
\* Garrett, Ind., 65 4 307 " "  
262 Glenwood, Ind. (formerly Vienna, Rush Co.).  
268 Hammond's, Ind., check Lake.  
\* St. Joe, Ind., 65 4 307 Chicago, Ill.  
\* Sunan, Ind., 50 3 370 " "  
436 Lenox, Iowa.  
527 Trego, Kas. (formerly Park's Fort).  
\* Hamilton, Ky., 50 3 263 Louisville.  
67 Conowingo, Md.  
200 Milton, Mich.  
200 New Haven, Mica.  
\* Ancra u Lead Mine, N. Y., 25 2 46 Poughkeepsie.  
\* Salt Point, N. Y., 25 2 46 " "  
\* Chicago Junction, O., 80 5 307 Chicago, Ill.  
\* Hicksville, O., 65 4 307 " "  
\* New Baltimore, O., 80 5 307 " "  
\* Republic, O., 80 5 307 " "  
52 Nazareth, Pa.  
\* Northfield, Que.  
256 Shellmound, Tenn.  
311 Hollow Rock, Tenn.  
574 Hilliard, Wy.

Sandy Creek Junction, N. Y., new office on other lines in last JOURNAL, is an office of the Montreal Telegraph Company.

WILLIAM ORTON,  
President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

RECEIPT OF ASSESSMENTS—NEW YORK, JAN. 11, 1875.

## ASSESSMENT No. 71.

8, 12, 25, 33, 55, 61, 65, 70, 76, 80, 84, 90, 98, 97, 100, 101, 120, 122, 134, 136, 139, 146, 154, 156, 158, 160, 164, 171, 176, 177, 183, 201, 202, 203, 206, 215, 218, 227, 228, 240, 244, 245, 247, 248, 252, 257, 269, 276, 315, 323, 328, 341, 353, 357, 360, 362, 364, 366, 371, 373, 382, 392, 393, 402, 406, 411, 412, 413, 418, 425, 441, 447, 456, 463, 484, 511, 512, 548, 556, 557, 565, 566, 574, 575, 577, 584, 587, 590, 600, 604, 618, 642, 646, 648, 655, 659, 662, 663, 664, 665, 669, 690, 694, 701, 708, 710, 712, 722, 723, 724, 728, 730, 733, 735, 772, 780, 781, 782, 783, 785, 786, 802, 803, 808, 809, 813, 820, 823, 830, 836, 838, 842, 848, 856, 870, 871, 876, 897, 901, 904, 905, 906, 926, 927, 930, 931, 938, 939, 942, 944, 949, 954, 957, 959, 963, 964, 976, 997, 980, 991, 992, 995, 998, 1000, 1002, 1005, 1011, 1014, 1016, 1028, 1030, 1031, 1033, 1034, 1041, 1046, 1050, 1055, 1057, 1058, 1063, 1069, 1074, 1076, 1080, 1085, 1099, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1125, 1127, 1131, 1141, 1144, 1152, 1164, 1167, 1190, 1191, 1193, 1194, 1196, 1205, 1210, 1211, 1224, 1234, 1237, 1238, 1241, 1248, 1255, 1256, 1260, 1266, 1268, 1269, 1270, 1274, 1276, 1277, 1281, 1283, 1284, 1285, 1286, 1289, 1290, 1292, 1294, 1307, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1358, 1359, 1366, 1372, 1375, 1376, 1385, 1389, 1390, 1391, 1405, 1406, 1412, 1415, 1421, 1427, 1428, 1430, 1432, 1433, 1438, 1448, 1453, 1457, 1458, 1465, 1469, 1471, 1474, 1476, 1481, 1483, 1490, 1497, 1500, 1501, 1513, 1515, 1524, 1528, 1529, 1530, 1537, 1542, 1546, 1558, 1560, 1573, 1576, 1580, 1586, 1593, 1594, 1596, 1597, 1616, 1630, 1635, 1649, 1650, 1661, 1662, 1663, 1665, 1666, 1667, 1673, 1684, 1687, 1688, 1696, 1700, 1701, 1702, 1704, 1709, 1710, 1713, 1714, 1718, 1724, 1728, 1737, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1769, 1771, 1785, 1788, 1789, 1790, 1795, 1796, 1797, 1802, 1804, 1813, 1817, 1823, 1824, 1828, 1830, 1837, 1838, 1839, 1840, 1841, 1844, 1845, 1857, 1858, 1859, 1860, 1863, 1864, 1874, 1876, 1877, 1889, 1895, 1896, 1900, 1907, 1911, 1913, 1914, 1943, 1958, 1969, 1970, 1972, 1973, 1986, 1992, 1993, 1996, 1997, 2004, 2007, 2010, 2012, 2021, 2022, 2023, 2024, 2033, 2035, 2041, 2044, 2045, 2048, 2050, 2053, 2072, 2074, 2075, 2085, 2089, 2092, 2103, 2104, 2110, 2112, 2119, 2120, 2123, 2125, 2131, 2133, 2134, 2136, 2137, 2142, 2154, 2156, 2157, 2167, 2168, 2171, 2183, 2184, 2185, 2187, 2194, 2196, 2200, 2202, 2211, 2215, 2217, 2220, 2221, 2223, 2224, 2225, 2226, 2227, 2230, 2231, 2234, 2238, 2243, 2245, 2246, 2250, 2252, 2254, 2258, 2261, 2265, 2266, 2267, 2268, 2271, 2273, 2277, 2284, 2286, 2290, 2292, 2293, 2300, 2301, 2303, 2304, 2307, 2323, 2324, 2325, 2326, 2327, 2328, 2335.

## MISCELLANEOUS.

70.—1626, 2253, 2273, 2275, 2276, 2277.

69.—232, 1915, 1921.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## THE RIGHT TO SET TELEGRAPH POLES ON STREETS.

A decision has been given by Judge Marsh, at Zanesville, Ohio, in regard to the right of a chartered company to set telegraph poles on a street. The points are as follows:

*First.*—The Legislature has the power to authorize the companies to occupy the highways of the State with their telegraph lines erected on poles.

*Second.*—The dedication of a street must be held to include a use of all such improved methods of transportation and transmitting intelligence as future improvements may require, subject to the rule that no one method of travel or transit shall exclude any other, or interfere with its free exercise.

*Third.*—The original dedication contemplates all needed improvements, and a special injury must be shown before an injunction in any case can be granted.

The right of an individual to erect wires along a highway was disposed of, the Court saying that, without a special act of the Legislature, he could not do so. Several Supreme Court decisions were cited bearing upon the case, all of which justified the Court in its decision.

## THE SOCIETY OF TELEGRAPH ENGINEERS.

The annual meeting of this Society was held on Wednesday evening, Dec. 9th.

Mr. Latimer Clark, Vice-President, took the chair.

The annual report of the Council was read by the Secretary, Mr. G. E. Preece. It stated that an accession of 131 members of all classes had taken place during the year, and showed the Society to be in a most satisfactory and prosperous condition. The council had to record the loss of Mr. Ricketts, one of the first members of the Society, who had met with an untimely end through the foundering of the steamship La Plata.

The Chairman expressed the sympathy of the Society with the families of those electricians who had perished in the La Plata. One of them (as stated in the report) was a member of the Society, and another was a relative of the President, Sir William Thomson. He hoped that all the members would subscribe to the fund which was being raised to help the bereaved families.

On the motion of, the Chairman, it was resolved that the report be adopted and printed.

A ballot was taken for the officers and council for the ensuing year. Mr. Langdon and Mr. Von Truenfeld acted as scrutineers. The following is the result as far as regards the officers of the Society:—President, Mr. Latimer Clark; Vice-Presidents, Prof. Abel, Mr. Culley, Prof. Foster and Mr. Walker; Treasurer, Major Webber; Hon. Sec., Major Bolton.

Mr. Walter Hancock moved "that the best thanks of this Society be accorded to Prof. Sir William Thomson, F. R. S., for the manner in which he has filled the chair during the past year, and for the assistance that he has afforded the Society in furthering its proceedings." He said that he was sure that the motion would meet with the most cordial acceptance on the part of every member. The name of Sir William Thomson was a household word amongst electricians and other scientific men. He had conducted laborious investigations into the speed of the transmission of messages, and devised the most marvelous and beautiful instrument, the reflecting galvanometer, and also that very wonderful and simple instrument, the quadrant electrometer; and these three achievements were such as would stamp him for all time as a man who had left his mark on electrical science, and a most useful and indelible mark on telegraphy.

Mr. Sievwright seconded the motion, and spoke in the highest terms of the help and advantage which the Society had derived from Sir William Thomson during his presidency.

The motion was carried by acclamation.

Colonel Stotherd moved "that the thanks of the Society of Telegraph Engineers be accorded to the President and Council of the Institute of Civil Engineers, for their continued liberality and kindness in affording this Society the free use of this magnificent hall, and the other apartments of the building."

Major Webber seconded the motion. He said that he hoped that the day, which was shadowed forth in the report, when they would have a hall of their own, was very far distant, for he felt sure that they would never get such a comfortable place as that in which they were now assembled. As treasurer, he thought that he could say that that day was really a distant one. (Laughter.)

The motion was carried unanimously. This concluded the business of the annual meeting.—*The Telegraphic Journal.*

WERE it not for the clouds that darken us there would be no rainbow in our lives.

## THE LOSS OF THE "LA PLATA."

Every year as this season comes upon us there follows in its train the usual black list of railway accidents and shipping disasters. Of the latter, one of the most dreadful of late years is the loss of the well-known cable ship, the *La Plata*, the news of which reached London on Wednesday, the 3d inst. She had been chartered from the owner (Mr. Henley) by Messrs. Siemens Brothers, for the purpose of laying the last section of the Platino-Brazil-eira cable, manufactured by that firm. With from 200 to 300 miles of it on board, she left their Works at New Charlton on Monday, the 23d ult., and, after a good run down the Channel, dropped the pilot off the Isle of Wight at 6 A. M. on the following Friday. In the evening of that day a gale sprang up, yet still she held on her way, until, on the Saturday morning, she was on the skirts of the Bay of Biscay, with a fearfully-high sea running. The weather went from bad to worse all day on Saturday, and by midnight orders were given to set the fore and aft mainsails, to keep the ship up to the wind. But the hurricane blew with such tremendous violence that—to quote the words of one of the survivors—"in a few minutes the sheet was carried away, the sail defied all efforts to take it in, and the canvas was blown out of the bolt-ropes, the remnants being cut away at daybreak." About two o'clock on Sunday morning the vessel shipped a very heavy sea, which carried away the port jolly-boat and davits, and in less than two hours afterwards the starboard waist-boat went in the same way. Between 8 and 9 the ship was reported to be making a great quantity of water, and in order to lighten her a portion of the cable was paid out over the bow. Still no headway could be made; by 10 o'clock the fires were all out, and preparations were then made to abandon the vessel. One boat, containing twelve persons, succeeded in getting clear, and three others were afterwards picked up; but these fifteen were all who escaped, for at 12:30 the ill-fated *La Plata* foundered, stern first, with sixty souls on board, including the captain, the first engineer, all the mates, and the whole of the electrical and cable staff—sixteen in number. All the survivors agree in bearing witness to the noble conduct of Captain Dudden, who stuck to his post from the moment when there was even the faintest anticipation of danger; and they likewise testify to the manly bearing of the officers of the electric staff, who "worked nobly at the boats and rafts, getting up stores and provisions, ready to leave the ship," when it became evident that she would have to be abandoned.

The rumors that the *La Plata* had been overloaded, that she was fitted with unusually heavy gear, and the like, are entirely without foundation. Her total capacity was 1,656 tons, and at the time she sunk her total load could not have been within 500 tons of that; there were on board 920 tons of cable and machinery, and about 200 tons of coal. She was fitted with the usual picking-up gear common to all the modern cable ships; and the catastrophe, so far as one can judge, was due to the water having forced its way—through the rents made in the vessel's side—to the fires, and, by extinguishing these, placed her wholly at the mercy of the winds and waves.

The following list contains the names of the electric and cable staff, every one of whom has perished: F. H. Ricketts, chief engineer in charge of the Expedition; C. A. Cramer, assistant engineer; A. Culhane, assistant engineer; King (Platino-Brazil-eira Telegraph Company); Gockelen, electrician; Blake, electrician; Voullaire, fitter; Gericka, fitter;

Richardson, joiner; Owen, joiner; Franks, foreman; Kelly, cable foreman; Mitchell, storekeeper; Telbury, engine driver; Newman, cabin boy; Charles Lowe, diver.

The Lord Mayor has consented to receive subscriptions towards the "La Plata Widows and Orphans' Aid Fund." Subscriptions are also received by Mr. W. T. Henley, 110 Fenchurch street, E. C.; The London and Westminster Bank, St. James's square, S. W.; Messrs. Grant Brothers & Co., 24 Lombard street, and by Messrs. Siemens Brothers, 12 Queen Anne's Gate, S. W.

On the night of the 9th inst. the following telegram was received by Messrs. Siemens Brothers:

"From Desart to Sir James Anderson, for Mr. Henley:

"Boatswain and Quartermaster of *La Plata* landed here. *La Plata* foundered 29th November. Cable thrown overboard to lighten ship. Boatswain and Quartermaster taken down with ship, but rose and got hold of some wreckage, to which they clung until 10 A. M. on 2d, and were picked up by Dutch cutter *William Renkelzoor*; names, Hooper and Lamont.—*The Telegraphic Journal*.

## TELEGRAPHIC PROGRESS ON THE PACIFIC COAST.

We extract the following interesting information regarding the progress of the telegraph on the Pacific coast, from the special San Francisco correspondence of the *San Diego Union*:

To a certain extent the business life of a community can be quite accurately gauged by the amount of telegraphing from and to that point. In this day of cheap telegraphing no business of any importance is carried on without more or less assistance from the telegraph, and the regular monthly reports to any telegraph headquarters from the different cities and towns are good thermometers, showing the rise or decline of business activity in the different localities.

The telegraph in its workings is no respecter of persons—"first come first served" is the standing order—Uncle Sam of course excepted. Peter Short's telegram to his grocer for a sack of potatoes goes according to its number, notwithstanding the impatient elbowing of the message behind it ordering the purchase of a railroad or line of steamships.

With the unprecedented increase of telegraphic facilities on the Pacific coast during the now closing year, the patrons of the telegraph can certainly be accommodated with speed—the second desideratum in the business—and with such pioneers as Col. James Gamble and Frank Jaynes, of the Western Union, in charge of the principal lines, there is but little fear of the first requisite, *i. e.* accuracy, suffering.

The Western Union's line construction and reconstruction this year has only been limited by the number of competent foremen to take charge of the work. Early in the season all the District Superintendents were drafted to the front, and most of them are still there, working all day and praying all night that the agricultural gentlemen who asked for these early rains may never realize what *damp bad* work telegraph building in the rain is.

The following is a brief statement of the most important work this year:

A one-wire line from Salinas to Santa Barbara, 241 miles. This extension was described at length in the *Union* some months since.

The line from Downieville through Sierra City, Jamieson and Quincy to Greenville—85 miles. This fills a long-needed want in Plumas County.

The Cloverdale line was extended to Ukiah, 31 miles.

Construction of three new wires and re-insulating four old ones from Reno to Virginia. Rebuilding the Overland lines from Emigrant Gap to Summit, 22 miles—everything new except the post holes. The wires used on this work is No. 6 galvanized, 525 lbs. to the mile, the heaviest ever used on this coast. These two last jobs were under the personal supervision of Supt. Frank Bell, and reflect great credit on the builder.

The Overland lines have been further reconstructed by putting in new poles, cross-arms and insulators between Promontory and Ogden, 53 miles.

The line along the North Pacific Coast Narrow Gauge Railroad is completed from Sancedito to Tomales, 50 miles.

The Northern line has been entirely rebuilt from Yreka, Cal., to Roseburg, Oregon, 160 miles. Four thousand new poles and thirty-two tons No. 7 wire formed part of the material used.

From Shasta to French Gulch, 16 miles, new poles and other extensive repairs.

From Sacramento to Roseville Junction, 18 miles, seven wires were re-insulated upon new cross-arms.

Roseville Junction to Marysville, 34 miles, thoroughly re-insulated.

Marysville to Colusa, 28 miles, and Nevada to Camptonville, 19 miles, overhauled and put in good shape.

Portland, O., to Kalama, W. T., 47 miles; Tenino, W. T., to Victoria, B. C., 200 miles. The lines were entirely reconstructed at heavy expense.

Several proposed extensions are postponed until next year for reasons above given.

The Colusa Lake and Mendocino Telegraph Co. have extended their lines and opened a number of new offices.

The Western Union will, this Winter, construct entirely new lines through the Cities of San Francisco and Sacramento; extra heavy forty-foot poles will be used, and no expense spared to make a neat and substantial job.

Mr. Jas. Gamble, Gen'l Supt. Pacific Division W. U. Tel. Co., who has just returned from New York, brought, among other electrical apparatus, a number of samples of cable proposed to be used in the Pacific Ocean submerged line, and Mr. Gamble speaks hopefully of an early start on this work.

The Duplex System, by which two messages are sent over one wire at the same time, has been lately introduced by Supt. Gamble upon the Overland, the Virginia, Nev., and the Sacramento circuits, with great success. This, practically, doubles the Company's facilities on these routes. As soon as a supply of the quadruplex (four messages over one wire at once) instruments can be made in New York, the Pacific Division will be stocked on the "heavy" lines.

Further and extensive improvements are to be made during the coming season, of which you will be duly advised.

## BORN.

VAN TYNE.—To Mr. A. E. VAN TYNE, assistant chief operator, Western Union office, St. Louis, Mo., December 31st, 1874, a daughter.

## MARRIED.

BOLLES—BRIGGS.—At New Bedford, Mass., Jan. 3, 1875, at the residence of the bride's parents, by Rev. B. P. Raymond, Henry C. Bolles, telegraph operator, to Miss Annie Briggs, all of New Bedford.

HOFF—WARNE.—On Thursday, Dec. 24, 1874, at the residence of the bride's father, Dover, N. J., by Rev. J. R. Daniels, William L. Hoff, manager Western Union Telegraph office, Washington, N. J., to Maggie M. Warne.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

**JOURNAL OF THE TELEGRAPH,**

Western Union Telegraph Company,

145 Broadway, New York.

**NEW YORK, JANUARY 15, 1875.**

The lines of the Great Western Telegraph Company, extending in the States of Illinois, Iowa, Minnesota and Wisconsin, which for some time past have been in the hands of a Receiver, have been leased by the Western Union Telegraph Company.

MANAGERS of offices will please take notice that in the adjustment of check errors caused by the check of a message being changed in transmission from "collect" to "paid," there should accompany the explanation given by the office at which such message originated an explicit account indicating the offices between which the change of check occurred.

### EXPOSING A FRAUD.

Everybody knows that the Manhattan Quotation Company receive the daily quotations of the European markets from their own agents in Europe, or at least that they say they do. It is a peculiar circumstance, however, that these quotations are recorded by that Company every day about ten minutes after the figures are sent out by the Gold and Stock Company. On Saturday morning last, bogus quotations were picked up by the Manhattan people, and in a few minutes, these figures, which were exactly the reverse of the truth, appeared upon the instruments of that Company. Upon the strength of them, many transactions were made by parties who are served by the Manhattan Company, to their serious loss, and the price of gold advanced two points. As soon, however, as the correct quotations were furnished by the instruments of the Gold and Stock Company, the fraudulent character of the news disseminated by the Manhattan Company immediately became manifest. Gold reacted, and the indignation of the brokers found vent in the appointment of an Investigating Committee, who ascertained that the first dispatch was not authentic, and recommended that the indicator of the Manhattan Company be removed from the floor of the Exchange. The Executive Committee was authorized to offer a reward of \$500 for the discovery of the perpetrator of the fraud.

### THE INFLUENCE OF CHARACTER.

Almost every man whose memory is at all active, can recur to incidents in his history which, though perhaps trivial in their character, have left ineffaceable traces upon his mind or heart. Sometime away back in boyhood a kind word stirred his tears and connected him forever with the beaming face and the loving lips which uttered it. Perhaps later in life some manly utterance has aroused his faltering courage and changed the complexion of his life. And so also with multitudes of toilers congregated where the grime of labor is thick and its toil hard, a single patient, manly soul, who performs his daily task in silence, and whose voice is rarely heard, save perhaps as its inward peace makes itself known by a soft snatch of song scarcely audible above the noise of the file or plane, gives hope and courage to all the rest. It is in the nature of true courage and hope to dominate and control. Hence the value of men of character in all places and to all men.

And there is in this a source of stimulus to all who labor. Many an operator sitting to-day at his accustomed work, feels at times a wave of discouragement passing over him. He mourns the limits of his sphere. He places a low estimate on the value of his life. He passes to and fro between his home and office oppressed with the uselessness and hopelessness of his career. And yet, during all this time, other eyes are watching his faithful performance of duty, and find in him the stimulant to their own. And did he but know it, he may, by the simple force of a pure and consistent life, be forming those of many around him. The work of life thus viewed is grand and compensating. The only true nobility is still in doing well the work assigned us. Character tells everywhere. It may be long unseen, but will out sometime. Even where its sphere is subordinate, character tones, and modulates, and refines, wherever it moves and whatever it touches.

There is a simple and striking fact which so proves the power and universality of the interacting influences of even inanimate things upon each other, which, as it may serve to illustrate the value of personal character and explain its power, we give.

If a wafer be laid on a surface of a polished metal, which is then breathed upon, and if, when the moisture of the breath is evaporated the wafer is shaken off, we shall find that the whole polished surface is not as it was before, although our senses can detect no difference; for, if we breathe again upon it, the surface will be moist everywhere except upon the spot previously sheltered by the wafer, which will now appear as a spectral image on the surface. Again and again we breathe, and the moisture evaporates, but still the spectral wafer re-appears. This experiment succeeds after a lapse of many months if the metal be carefully put aside where its surface cannot be disturbed. The condition of the hard metal is changed in some imperceptible, mysterious way, perhaps forever.

It is thus that nothing leaves us wholly as it finds us. All men carry hammers, with which they are in-

denting one another, as with hand, or tongue, or eye, or heart, they abrade in life's hurried contacts. But character will always make the strokes which shall not only be imperishable, but shall elevate and bless. No good life is a failure. If it do nothing more than beat out the sadness of another, and give new courage where hope is low, even this is coronal work and not to be despised.

And when the evening comes and the toilers of this busy world rest, the crowns shall be worn by the faithful men, however humble, who were true to themselves and to their comrades and to their appointed toil. And they shall find that character is, like the sunlight, incalculably diffusive; and that, as George Elliot beautifully says, "the growing good of the world is partly dependent on unhistoric acts; and that things are not so ill with us as they might have been is half owing to the number of those who lived faithfully a hidden life, and rest now in unvisited tombs."

### THE MISSING STEAMER FARADAY.

Nothing later than what appeared in the JOURNAL of January 1st has been heard from the *Faraday* and the Direct United States Cable expedition. English shareholders are relieving their feelings in letters to the London papers, in which unpleasant facts are mentioned, and still more unpleasant questions are asked. But the Directors make no sign.

The cable is still supposed to be buoyed at a point within a day's sail of the American coast, but nothing has been heard from the *Faraday* for nearly a month. Where is she?

### A CASE OF MISFORTUNE.

We have received the following letter from the Secretary of the Telegraphers' Mutual Benefit Association. Upon personal investigation of the facts in the case, we are convinced that this unfortunate family are in want of immediate assistance beyond that which the comparative few in this vicinity are able to afford, and so we place the matter before the brotherhood of operators in the full conviction that every one who has a little, no matter how little, to spare, will give to those who need so badly. In the spirit of the Master, "Inasmuch as ye have done it unto one of the least of these my brethren, ye have done it unto me."

To the Editor of the Journal of the Telegraph:

A case of genuine misfortune has come to the notice of the officers of the Telegraphers' Mutual Benefit Association.

A very worthy man, and good telegrapher, for nearly ten years employed in one of the larger offices of the Western Union Company, has been compelled to withdraw from the Association from sheer inability to meet the assessments. In October, 1868, he was prostrated by nervous debility, and a neuralgic affection of the head, and was unable to work for three years. In 1871 he again entered the service and remained for two years, when his troubles returned with greater severity, and he was forced to resign his position and leave the business. He learned to sew shoes, and is able by steady application to earn from \$3 to \$3.50 per week when



he is able to work. Upon this amount, himself, his wife, who is very ill with cancer, and two small children, are subsisting in a country village in New Hampshire. The means of their relatives and friends have become exhausted, and the future appears very dark to the sick father and mother. Upon these facts becoming known, several kind gentlemen attached to the Western Union Company's service in New York made his assessments good, and will continue to do so until better days shall come, and will aid him still further; and it is hoped that the fraternity throughout the country will also come to the assistance of this brother and his little ones in this hour of their great distress. Will you please put the matter before them?

WM HOLMES.

Contributions may be sent to Mr. Wm. Holmes, No. 145 Broadway, New York; or to the Editor of the JOURNAL, who will gladly receive and forward the same, making due acknowledgments.

#### RESIGNATION OF GEN. ECKERT.

WESTERN UNION TELEGRAPH COMPANY,  
EASTERN DIVISION,  
NEW YORK, January 9, 1875.

DEAR SIR: I hereby respectfully resign the positions of General Superintendent of the Eastern Division of the Western Union Telegraph Company, and of Director and Traffic Manager of the International Ocean Telegraph Company, which resignations I prefer should take effect at once.

Very respectfully,

(Signed) THOS. T. ECKERT.

Hon. WILLIAM ORTON,  
President W. U. and I. O. Telegraph Cos.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, January 12, 1875.

Gen. THOMAS T. ECKERT,

DEAR SIR: At a personal interview solicited by you yesterday, you tendered to me your written resignation as General Superintendent of the Eastern Division of the Western Union Telegraph Company. The resignation, which was dated the 9th inst., and which you desired should take effect at once, was the first intimation of your purpose that I had received.

In view of the fact, now clearly ascertained, that, while holding a confidential position with this Company, you have been, for some time past, secretly carrying on negotiations with its enemies, and before tendering your resignation, had made arrangements to accept employment in the service of the opposition, I promptly comply with your request, and your resignation is accepted hereby.

Vice-President Mumford has been instructed to take charge of your office and assume its duties for the time being. Very respectfully,

(Signed) WILLIAM ORTON,  
President.

#### THE CANADIAN TELEGRAPHERS' MUTUAL INSURANCE ASSOCIATION.

The telegraphers of Canada have formed an insurance association similar in many respects to the Telegraphers' Mutual Benefit Association, and have elected the following officers:

President, J. Stephenson; Vice-President, Hugh Neilson; Secretary, B. J. Hickey; Treasurer, J. S. McConnell; Executive Committee, C. R. Hosmer, J. S. McKenzie, A. T. Nurse, D. McCarthy, P. McPhee.

#### ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from page 9.)

MINUTES OF EVIDENCE TAKEN BEFORE THE COMMITTEE,  
WEDNESDAY, JULY 1, 1868.

The Chancellor of the Exchequer in the Chair.

FRANK IVES SCUDAMORE, Esq., called in and examined by Mr. Sargood.

Mr. SCUDAMORE stated that he was one of the assistant secretaries of the post-office, and had been connected with the establishment since 1840. Remembered a memorandum in support of the expediency of the telegraphic communication of the kingdom being placed in the hands of Her Majesty's Government, prepared as early as 1858 by the Chairman of the Electric and International Telegraph Company, and forwarded to Mr. Gladstone, but received no particular attention at that time.

Mr. SARGOOD. However, in 1865, did the Edinburgh Chamber of Commerce revive the subject by some action?

Mr. SCUDAMORE. In the Autumn of that year they appointed a committee to inquire into the subject, and the chairman of that committee, Mr. George Harrison, who is now the President of the Edinburgh Chamber of Commerce, prepared a report, which is printed in the blue book to which you have referred. [Parliamentary Paper No. 80, published in 1868.]

Mr. SARGOOD. Do you remember at what page it is?

Mr. SCUDAMORE. It is at pages 51 to 54 of that blue book.

Mr. SARGOOD. I believe some other chambers of commerce followed in that direction, did they not?

Mr. SCUDAMORE. Almost all the chambers of commerce in the kingdom; but the Associated Chamber of Commerce notably presented a petition which is printed at pages 57 and 58 of the same book.

Mr. SARGOOD. Have you that letter here, or a copy of it?

Mr. SCUDAMORE. I have an extract from it here.

Mr. SARGOOD. What was the date of it, do you remember?

Mr. SCUDAMORE. It was dated in September, 1865. I cannot tell you the precise date from memory.

Mr. SARGOOD. Will you give us the extract which you have from that letter?

Mr. SCUDAMORE. He desired me to inquire and report whether, in my opinion, the electric telegraph service might be beneficially worked by the post-office, and whether it would then possess any advantage over a system worked by private companies; and whether it would entail a very large expenditure on the department beyond the purchase of existing rights.

Mr. SARGOOD. Is that letter in the blue book?

Mr. SCUDAMORE. No; it is not in the blue book.

Mr. SARGOOD. Did you take up that inquiry, and continue your investigations for a considerable period?

Mr. SCUDAMORE. I did take it up after some little time, and after Lord Stanley had frequently pressed me to do so.

Mr. SARGOOD. And did you then make yourself master of what the views, as taken by the various chambers of commerce, were at that period?

Mr. SCUDAMORE. I did.

Mr. SARGOOD. I think you have taken the trouble to condense them into a summary of five or six headings, and you may give them to us in your own words again.

Mr. SCUDAMORE. The chambers of commerce, and the supporters of the proposition generally, concurred in thinking, among other things, that the existing charges for the transmission of messages are too high; that many places and districts are unprovided with facilities for telegraphic communication; that, in the great majority of places which are provided with facilities for telegraphic communication, the telegraph office is inconveniently remote from the center of business and population, and open for too small a portion of the day. That in the countries in which the telegraphs are under the control of the State, lower rates and a more wide-spread telegraphic system prevail. That, in such countries, correspondence by telegraph has become more general, and, as it were, more popular than in this country, and, lastly, that in the United Kingdom like results would follow the

adoption of like means, and that from the annexation of the English telegraphs to the English post-office, there would accrue great advantage to the public, and ultimately a large revenue to the State. They broached some other propositions, which I have not included in that summary, because my inquiries did not enable me to substantiate them.

Mr. SARGOOD. I may venture to ask you probably, on this communication from Lord Stanley, did you take up this question with a view of inquiring into it dispassionately, or did you take it up as a partisan and advocate the principle of giving this telegraph business to the post-office?

Mr. SCUDAMORE. So far from taking it up as a partisan, I took it up rather reluctantly, and not, I may say, until I had really been whipped into it by Lord Stanley.

Mr. SARGOOD. Then your original views were not so much in sympathy with the bill as they are this year?

Mr. SCUDAMORE. I think it was partly idleness. I had had one or two heavy jobs, and I fore-saw that this would be a very heavy job indeed, and presume that I was quite right, in what has taken place to-day, in that belief; I was very reluctant indeed to enter upon it.

MINUTES OF EVIDENCE TAKEN BEFORE THE COMMITTEE,  
THURSDAY, JULY 9, 1868.

The Chancellor of the Exchequer in the Chair.

FRANK IVES SCUDAMORE, Esq., called in and examined by Mr. Rodwell.

Mr. RODWELL. I want more particularly to call your attention to the financial arrangements; I think you stated the other day to the Committee that in various foreign countries the reduction of the rate charged had always been followed by a very large and immediate increase in the number of messages.

Mr. SCUDAMORE. I did.

Mr. RODWELL. For the sake of your future evidence will you just recapitulate them?

Mr. SCUDAMORE. I said that in Belgium, in 1863, a reduction of 33 per cent. produced an immediate increase of 80 per cent. in the number of messages. That in 1866, in the same country, a drop of 50 per cent. in the rate produced an immediate increase of 85 per cent. in messages. That in Prussia, in 1867, a reduction of 33 per cent. in the rate was followed by an increase, in the very first month after the change, of 70 per cent. in messages. That in France, in 1862, a reduction of 35 per cent. in the rate was followed by an increase of 64 per cent. in messages. I added that the most remarkable illustration was furnished by the experience of Switzerland in the first three months of this year. The Swiss inland rate was reduced by 50 per cent. upon the first of January this year, and in the first three months there was an increase of 90 per cent. in the number of inland messages over the corresponding three months of the previous year.

Mr. RODWELL. And you added that the remarkable fact that these increases had all taken place directly the reduction had been made?

Mr. SCUDAMORE. I did.

Here follow numerous questions by various members of the Committee respecting the probable increase of the traffic under Government control and other pertinent matters, which are responded to by Mr. Scudamore, and then follows an examination as to the estimated expenditure for carrying on the service.

Mr. SARGOOD. What was your estimate of expenditure in 1866?

Mr. SCUDAMORE. In July, 1866, I put it at £456,000; in February, 1868, £425,000; and in June of this year, £415,000. I have now put it at £379,000. The difference arises mostly from the fact that until now I was obliged to guess at the amount which the telegraph companies themselves would save by amalgamation, and also partly from the fact that I did not know what was the cost of making and maintaining submarine cables.

Here follows a discussion as to the increase of the traffic and its effect upon the net revenue.

Mr. SARGOOD. You have rather made your calculations with a view to show the positive certainty of this experiment being a safe one, I suppose?

Mr. SCUDAMORE. Yes; I wanted the maximum estimate

to be a moderate estimate. I think the minimum estimate is an impossible one. My object has been to convince the Committee that they may, with almost entire certainty, rely upon a net revenue within a range of from £200,000 to £360,000, the mean of which is £280,000.

Mr. SARGOOD. With that £280,000 as income, that would represent a pretty large capital, if you should need it, for any purchases you would require. Have you gone into the question at all as to the capital that would be required?

Mr. SCUDAMORE. I have, from time to time, made estimates of the capital required for the purchase of the interests which we shall have to buy, but I have no estimate to give now necessarily.

Mr. SARGOOD. They are becoming rather delicate subjects now that it is reduced to a question of arbitration?

Mr. SCUDAMORE. It would be impossible now to give any estimate of the amount of capital required.

Mr. SARGOOD. It would not be fair to either side to enter into the subject with the agreements before us.

Mr. SCUDAMORE. No; I leave it to the other side to take care of themselves. It would not be fair for the postmaster-general to give any estimate.

Mr. SARGOOD. That income that we have now touched upon as the minimum income which could possibly arise from the telegraphs represents a large amount of capital—much more than you can ever want.

Mr. SCUDAMORE. It represents a larger or smaller amount of capital, according to the terms on which you raise it; that is, according to whether you wish to wipe out your capital in a given number of years or leave it as a permanent charge. I should like to say one word with reference to the discrepancies that are sure to be discovered some day or other between the different estimates which I have made of the capital and of the amount which will probably have to be paid, and it is this, that if hereafter we have to give more than I have at any time supposed we should have to give, it is really because in giving a greater sum we are going to get a greater sum for it than I have ever supposed it possible we could get. We are going to buy a greater trade than I thought there was in the country. That will be the main reason of any difference between past estimates and future experience.

Mr. SARGOOD. In fact, if the concern is what the gentlemen who at present own the property call it, namely, a good and profitable undertaking, the more you have to pay the better, because it will represent that you are getting more than you expected to get?

Mr. SCUDAMORE. Within certain limits, I would agree to that, but not precisely as you put it.

Mr. SARGOOD. I put it rather more strongly than you put it; however, you are looking to the purchase of that which is profitable, and not that which is a loss?

Mr. SCUDAMORE. Yes.

Mr. SARGOOD. It may be put in that way?

Mr. SCUDAMORE. Undoubtedly.

Mr. SARGOOD. Therefore, whatever you have to pay, subject to the question of arbitration, must be assumed to be at any rate a proper *quid pro quo*?

Mr. SCUDAMORE. Undoubtedly.

Here follow a great many questions by various members of the Committee and replies by Mr. Scudamore, which I will not occupy your time in reading, but will proceed at once to the question of the estimated cost.

Mr. GOSCHEN. In your report of February, 1868, you gave the amount of the working expenses of the four telegraph companies as £345,000?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. I gather that, in your original estimate in 1866, you gave the probable cost of the post-office as £456,000?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. In your report in February, 1868, you gave the probable expenditure as £425,000?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. And now you give the probable expenditure as £380,000?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. That is to say, in every successive estimate, your estimate of expenditure has decreased?

Mr. SCUDAMORE. Yes; for the reasons which I have explained to the Committee this morning.

Mr. GOSCHEN. On the other hand, in every successive estimate of the cost of purchase your estimate has increased?

Mr. SCUDAMORE. No; not quite so, I think.

Mr. GOSCHEN. I think you began with £2,400,000.

Mr. SCUDAMORE. Yes. I beg your pardon, that was so.

Mr. GOSCHEN. Then you mount up to £3,000,000, and now we are at a sum considerably beyond that?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. Therefore it is fortunate that you find that your estimate of the expenditure has been able to decrease side by side with the progressive increase in the amount of the purchase money that will have to be paid?

Mr. SCUDAMORE. Undoubtedly.

Mr. GOSCHEN. I say fortunate, because if it had not been so there would have been no margin at all.

Mr. SCUDAMORE. No; I think there is a large margin in each case.

Mr. GOSCHEN. We will try and make that out. Your original estimate of expenditure was £456,000?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. And your minimum estimate of receipts is £467,000?

Mr. SCUDAMORE. Yes, provided there is no increase at all, but to that is to be added £12,000 and £45,000.

The CHAIRMAN. Is that the estimate of the inland messages alone?

Mr. SCUDAMORE. Yes; inland messages only, as all the estimates were.

Mr. GOSCHEN. To that £437,000 you have to add £12,000 for press news and £45,000 for continental messages?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. Therefore you would have it in round numbers 495,000?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. Against an expenditure of about £456,000?

Mr. SCUDAMORE. No, not at all; that estimated expenditure of £456,000 includes the estimate for the increase of business which you are striking out from revenue, but then, in comparing my estimates for the previous years, you must compare them with the present maximum estimate, and not with the minimum estimate, because all those estimates include something for increase of business, and in my minimum estimate no increase of business is taken into account.

Mr. GOSCHEN. You started originally with an expenditure of £456,000, and you have added nearly £120,000 for extensions made by the post-office?

Mr. SCUDAMORE. Yes, but if you will allow me, that estimate was made in a totally different way. If you will refer to the new estimate of the 6th of January, 1868, which is made upon the same principle as the maximum estimate which I have given this morning, you will find that they will compare more accurately. The estimate of February, 1868, you will find on pages 146 and 147 of my report.

Mr. GOSCHEN. As a matter of fact, the more you have looked into the matter the more you have found that the expense decreased.

Mr. SCUDAMORE. The two first estimates tallied very closely indeed as to the estimate of expenditure. It is only since I have been able to get more complete data as to what the companies themselves would save by the amalgamation that I have really brought down the estimate.

Mr. GOSCHEN. Then your being able to get more complete data as to the expenditure is contemporaneous in date with the higher terms offered to the companies?

Mr. SCUDAMORE. There is no doubt that they have been more willing to communicate information since we have been on good terms with them.

Mr. GOSCHEN. Since you have been on good terms with them, as I understand, figures have been put before you to show that you might buy with advantage to yourselves, whereas, before, it was considered to be much more expensive?

Mr. SCUDAMORE. No; it is not quite so. Nothing has been put before me. I have had to ask for everything that I have wanted; only, before, if I had asked it, I could not have got it. That is the only difference.

After a discussion as to the amounts received and expended by the various companies carrying on the traffic, Mr. Goschen inquires as to the cost of the plant.

Mr. GOSCHEN. Can you tell me of the total cost how much of the £2,500,000 is represented by actual plant?

Mr. SCUDAMORE. Yes; I can tell you that; but I do not know that I can tell it to you now; I find that the companies have expended in construction somewhere about £2,300,000 or £2,300,000. I am not quite certain of the amount. I think it is probable that I am within the mark rather than over it.

Mr. GOSCHEN. Do you happen to know whether the expenses of putting down telegraphs have increased or decreased; could you do it now for £2,200,000, if you were to try to do it?

Mr. SCUDAMORE. I could do it for very much less, I should think, now; there is no question of that.

Mr. GOSCHEN. Do you think that 5, or even 7½ per cent. on £2,200,000 would be an extravagant sum to put by every year for repair and maintenance?

Mr. SCUDAMORE. Yes; I think it would be altogether too much. I think it would, quite enough to put by a sinking fund of 10 per cent. on the revenue; if you put by 7½ per cent. upon what you have already spent for construction, that being nearly the whole capital of the companies, there would be nothing left to them for dividends.

Mr. GOSCHEN. Would you be able to put in a statement and analyze the two and a half millions of the companies? You are going to buy the assets of the companies, and some of these assets represent property, that is to say, posts and wires and instruments, assets which exist at this moment. Another portion of it represents no value present at all, that is to say, a certain amount which has been spent on parliamentary proceedings, patents which have expired, and so forth; would you be able to show what amount is to be placed in each of those two classes?

Mr. SCUDAMORE. I should be very glad, indeed, if you would not ask me to put in any statement of my views as to the value of the property.

Mr. GOSCHEN. I do not mean the value, I mean the cost. The capital accounts of the various companies will show what they have done with their capital, and it will enable the committee to see what the public are actually buying.

Mr. SCUDAMORE. I am quite sure of that; it would enable the committee to see what they would buy, as far as the expenditure of the companies is concerned; but that is not the only sum involved in buying the trade of a company. For instance, if I may take a very low case as an illustration, if you buy a public house you buy something more than the building and the pots and barrels and beer-engines—you buy the trade which the man has acquired.

Mr. GOSCHEN. Do you propose to put in the accounts of the companies which have not been printed in this book?

Mr. SCUDAMORE. No.

Mr. GOSCHEN. I presume the promoters of the bill, before we are called upon to decide upon the preamble, will give us the fullest information, both as to the receipts and expenditures, and everything connected with the companies.

Mr. Rodwell was heard to state that the promoters were not prepared to do so; and even if they were to furnish that information it would lead to a very erroneous view of the matter, if it were to be supposed that they based their case upon the value of the property, *qua* the plant and the mere receipts of the companies; and, by way of illustration, he showed that in purchasing, for instance, the *Times* newspaper, the value of the plant would by no means represent the value of the newspaper.

(To be continued.)

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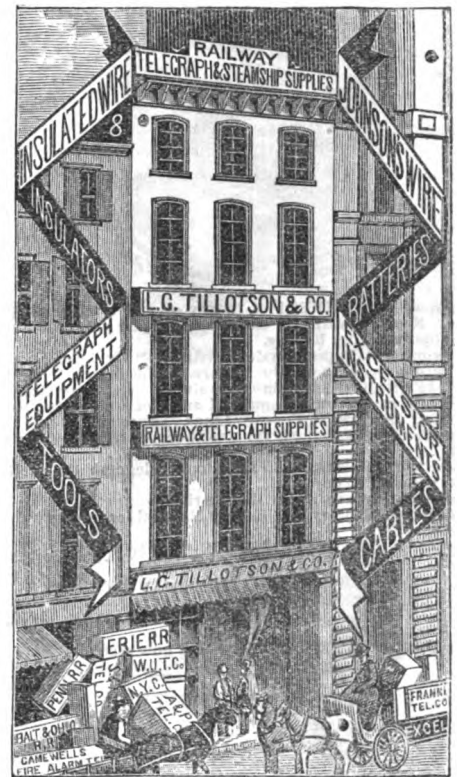
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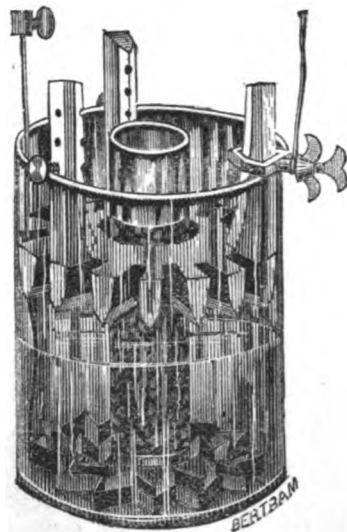
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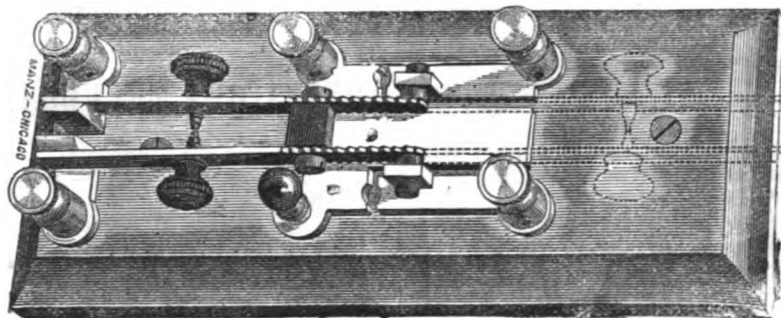
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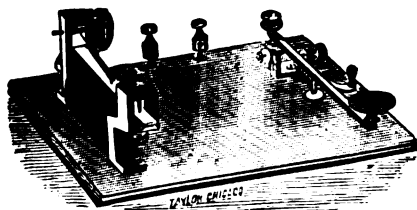
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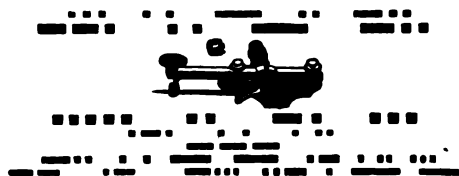
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TRADE MARK. PATENTED MAY 12th, 1874.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 40c., or 6 for \$2.

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The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

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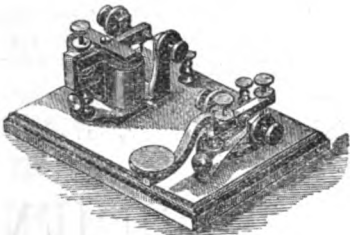
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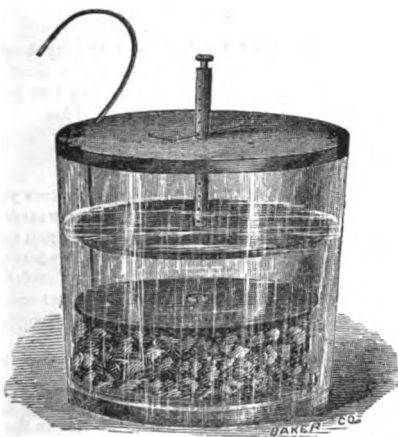
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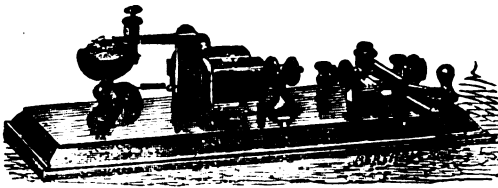
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President.

CORNELIUS ROOSEVELT,

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This system of Fire Alarm and Police Telegraph, with a Central office, or upon the

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is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM reliability:

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Chicago, Ill.,	Pittsburg, Pa.,
Cincinnati, Ohio,	Portland, Me.,
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Detroit, Mich.,	Richmond, Va.,
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The distinctive features of these systems of  
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Messrs. GAMEWELL & CO. are the owners of the original FARMER AND CHANNING PATENTS, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or effort to secure improvements, and the systems are now covered by

MORE THAN TWENTY PATENTS.

The introduction and operation of the AUTOMATIC SYSTEM involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

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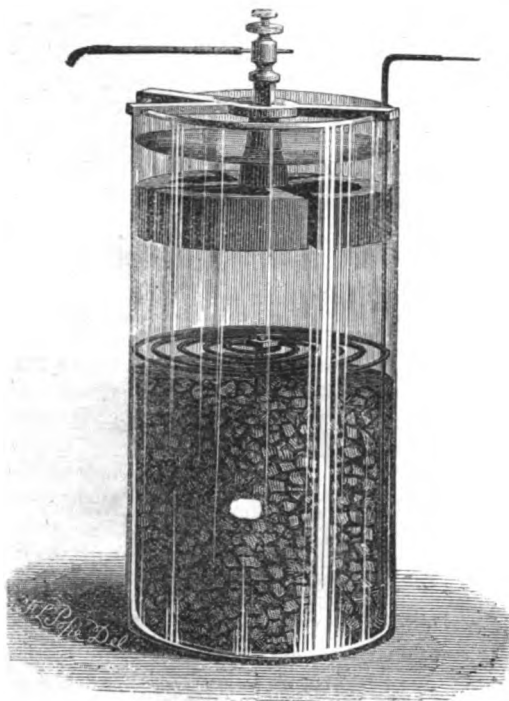






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This Battery has been in extended practical use for more than a year, and is now acknowledged by leading Electricians in this country and Europe to be

**FAR SUPERIOR TO ALL OTHERS**

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AT THE

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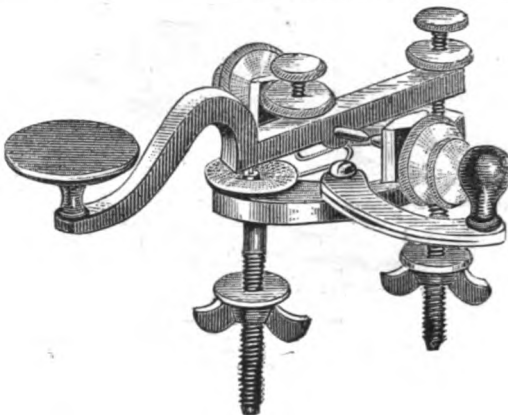
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**PATENT CIRCUIT-CLOSER KEY,**

Does not keep line closed by binding against the anvil. Slight pressure of the finger required to put lever in circuit or cut out.

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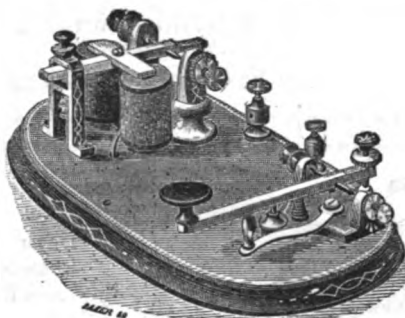
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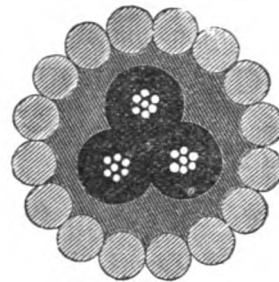
This Instrument is well finished, and gives a clear, loud sound. It is made to work on a line from a few feet to ten miles long. Give length of line in ordering Instruments. One cup of Bliss' Reservoir Battery is furnished with each Instrument.

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SUBMARINE TELEGRAPH CABLES,

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Address all communications to S. BISHOP,

**OFFICE AT FACTORY.**

John Pelhamus, Printer, 102 Nassau, cor. of Ann Street.



# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 3.

NEW YORK, FEBRUARY 1, 1875.

WHOLE NO. 174

## DESCRIPTION OF THE PNEUMATIC SYSTEM AS ADOPTED BY THE POSTAL TELEGRAPH DEPARTMENT IN THE UNITED KINGDOM.

### THE WILMOT VALVES.

The system of pneumatic transmission in use by the British Postal Department, is purely for the collection and dispatch of telegrams between the central station and the important branch offices.

The system is that of radiation from the central station. High speed being essential, tubes are laid direct to the branch offices. According to the importance of these offices is the number of tubes laid, the principal offices having two tubes, one for the "inwards," and the other for the "outwards" traffic. At the smaller stations the traffic is arranged through one tube.

The following are some details as to the methods of laying the tubes, and also as to the "carriers" employed for conveying the messages, and as to the system of "valves" adopted in the new General Post-Office in London.

### Laying Pneumatic Tubes.

The tubes are of lead; their internal diameter being  $2\frac{1}{4}$  inches for large stations, but where the traffic is small  $1\frac{1}{4}$  inch diameter is sufficient.

The tubes are manufactured in as long lengths as possible, the  $2\frac{1}{4}$ -inch tubes being in lengths of about 29 feet.

Each length is laid in a wooden trough as soon as manufactured, so that it may be handled without fear of bending.

A tightly fitting polished steel "mandril," attached to a strong chain, is then drawn through the entire length of the pipe (Fig. 3). This operation insures the pipe being smooth, cylindrical, and uniform throughout. It is necessary that the "mandril" should be lubricated with soft soap, so that it may not injure the pipe in passing through it.

When laid, the leaden tubes are protected by being inclosed in ordinary cast-iron pipes, so that the sinking of the ground, &c., may not injure them.

The process of laying and jointing the tubes is as follows:

The leaden tubes, drawn and smoothed as already mentioned, being heated and attached to this chain, is, of the intermittent action of the air-pumps.

explained, are delivered from the wooden troughs to the trench prepared to receive them.

The iron pipes are then drawn over the lead, leaving enough of the leaden pipe projecting to enable a "plumber's joint" to be made.

A strong chain is then passed through the length of tube to be joined on, and a polished iron mandril A (Fig. 1), similar to the one before men-

pushed half its length into the end of the pipe.

The new length of tube is then forced over the projecting end of the mandril, and the leaden tubes (the ends of which have been already cut flat by an apparatus made for the purpose) then butt perfectly together, and a plumber's joint is made in the usual manner. By this means the tube is perfectly airtight; and the mandril keeps the surface of the tube under the joint as smooth as at any other part of its length.

After the soldering process has been completed, the mandril is drawn out by the chain attached to it; the next length is drawn on, and the process repeated.

Where it is necessary to deviate from the straight line it is essential that the tubes be laid in a circular arc, whose radius shall not be less than 12 feet. The same care is necessary in entering the various stations, otherwise undue friction will arise, and curves would be introduced which might cause the carrier to stick fast.

### Method of Working.

The pneumatic tubes are all worked from one center, viz.: the central station, at which point the engines and air-pumps are fixed.

At the new General Post Office there are three engines, each of 50 horse power (nominal). They are of the Wolff type. Two are employed for exhausting and compressing the air; the third as a reserve in case of accident.

The air-pumps are each of the diameter of 35 inches, with three feet stroke, and are six in number, two being attached to each engine.

When the various tubes in the list (see further on) are at work it is found necessary to keep two engines going to supply an adequate amount of air.

Of the four pumps thus at work, one is engaged in compressing air, whilst three are required for exhausting air.

The pumps are so arranged that they can be altered from "compression" to "exhaust," and vice versa, at will.

To the pump are attached two large mains, one for pressure, and the other for vacuum. These mains are carried from the engine-room to the telegraphic gallery, where the pneumatic tubes are situated. These mains are of such dimensions as to obviate the effect

Figure 1.

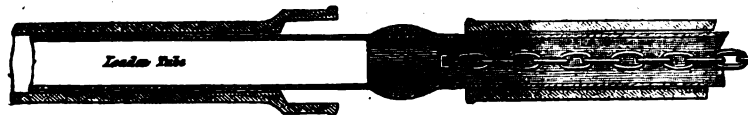


Fig. 2.



Fig. 3.



Figure 3.

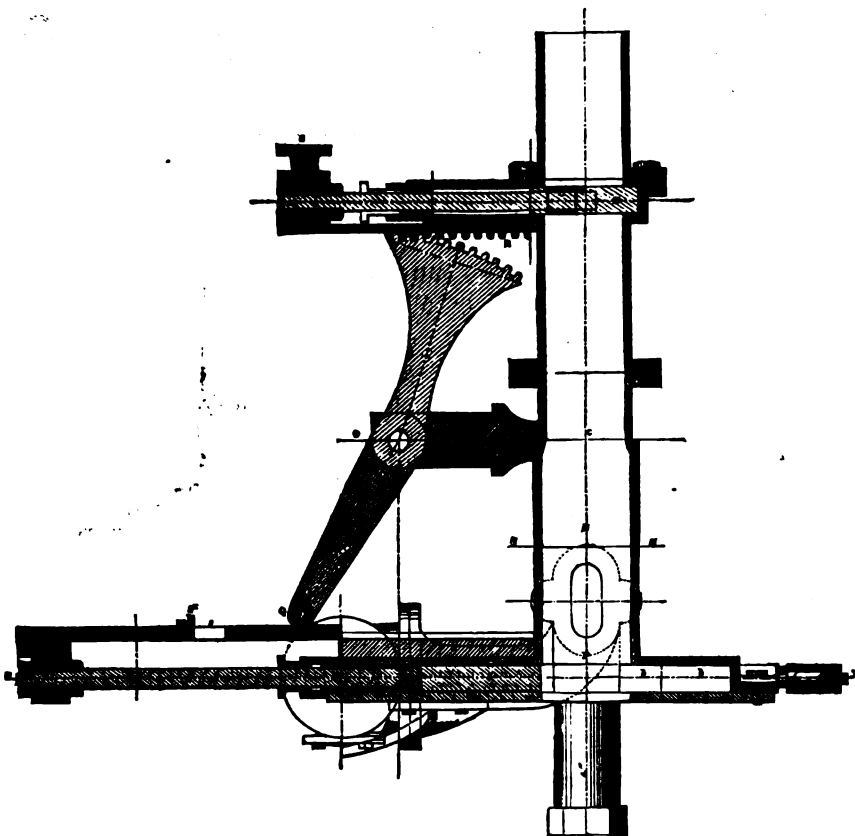


Figure 4.

The following is a tabulated statement showing the number and lengths of the pneumatic tubes between the central station, London, and the various branch offices in its vicinity.

LIST OF PNEUMATIC TUBES NOW AT WORK IN THE  
NEW GENERAL POST-OFFICE.

STATIONS.	No. of Tubes.	Length.	Total Length.
		Yards.	Yards.
West Strand.....	2	2,610	5,230
Stock Exchange.....	2	1,085	2,170
Submarine Company's Office.....	2	1,095	2,190
Gresham House.....	2	1,289	2,578
Leadenhall Street.....	2	1,230	2,460
Fenchurch Street.....	2	1,409	2,818
Cannon and Lower Thames Street.....	2	1,841	3,682
General Post-Office [Old].....	2	157	314
Telegraph Street.....	1	917	917
Anglo-American Company's Office.....	1	916	916
Founders Court.....	1	808	808
Lloyd's.....	1	954	954
Cornhill.....	1	965	965
Baltic Coffee House.....	1	1,192	1,192
East Cheap.....	1	1,337	1,337
Mark Lane.....	1	1,641	1,641
Ludgate Circus.....	1	777	777
Delivery.....	1	70	70
Total Length.....			31,009

Total Length, 17 miles 1,089 yards.

The tubes are arranged vertically side by side. Those which are used exclusively for forwarding messages are situated at one end of the table, those which are used for both forwarding and receiving in the center, and those for receiving only at the other end. The tube mentioned as "delivery" in the list is for the purpose of sending the received messages to a room below for delivery by hand.

*Description of Valves.*

The valves are so arranged that they can be employed for (1) exclusively forwarding messages by compressed air; (2) exclusively receiving messages by exhausting air; and (3) for alternate forwarding and receiving on a single tube.

The accompanying diagrams show, No. 4 a back view, No. 5 a section, and No. 6 a top view, of the "double sluice pneumatic valve." The following is a description of the method of using it and of its action.

*1. Forwarding or Outward Tube.*

To send a carrier, the method of working is as follows: The carrier containing the message is inserted up the mouth of the pneumatic valve P (Fig. 4) into the message chamber M, until its buffer is held by the contraction at C, which is the true diameter of the message tube. (The drawings show the valve in its normal position). The handle H is then drawn forward, carrying with it the sluice valve S, until the mouth of the message pipe P is closed. By this time the stop S' strikes against the tail of the quadrant Q, pressing it into the slot s of the steel slide bar B, and by the continuation of the motion necessary to bring the sluice valve S to the end of the sluice box b, bringing with it the tail of the quadrant, which is centered at O, giving an opposite motion to its other extremity, which, fitting into the rack R, opens the top sluice T. During

this motion an inclined plane I (Fig. 6), which is fixed upon one of the side rods carrying the lower sluice, passes between the fixed roller F and the roller fitted upon the pressure valve V, establishing communication between the pressure main and the message pipe; the air thus admitted immediately acts upon the lower part of the carrier (which portion it expands, so as to make it fit the pipe with as little friction as possible), and forces it onwards to its destination. If it be necessary to send a second carrier whilst the first is in transit (a process which is undesirable) the handle H (Fig. 4) is pushed back to its normal position, thus producing a reverse motion of the valves by closing the upper part of the tube before the lower part is opened, thereby preventing any discharge from the message tube. The second carrier is then inserted and the handle pulled forward as previously explained, again opening com-

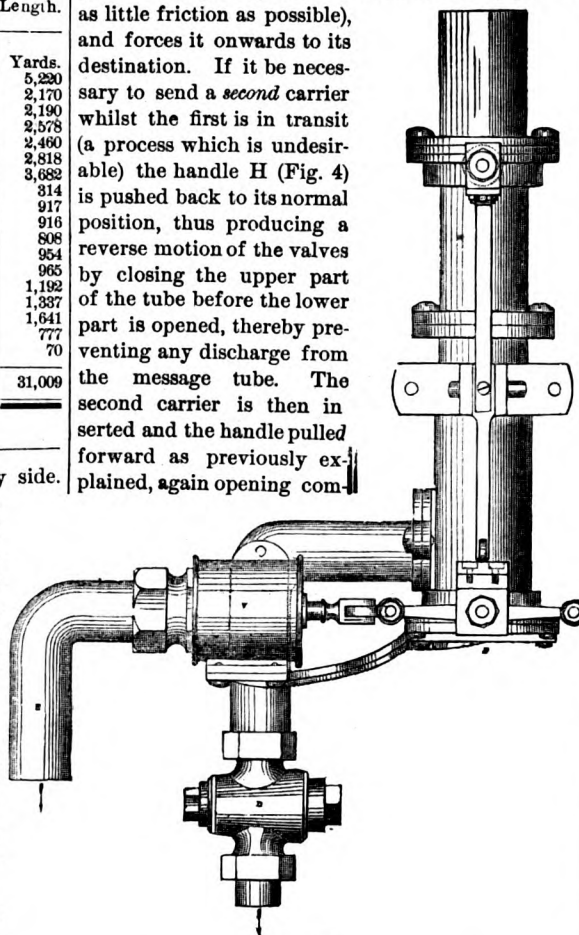


Figure 5.

munication with the compressed air in the main. The time necessary for this operation being about four seconds, it can be easily understood that in the length of pipe the momentary cutting off the pressure is hardly felt, so that the speed of the first carrier is not necessarily lessened. It must be understood that the cock D (Fig. 5) is always closed.

The foregoing description applies to a pneumatic tube used entirely for forwarding carriers by means of compressed air.

*2. Receiving or Inward Tube.*

For receiving carriers the communication between the pressure main and the pressure valve V, is first cut off by means of

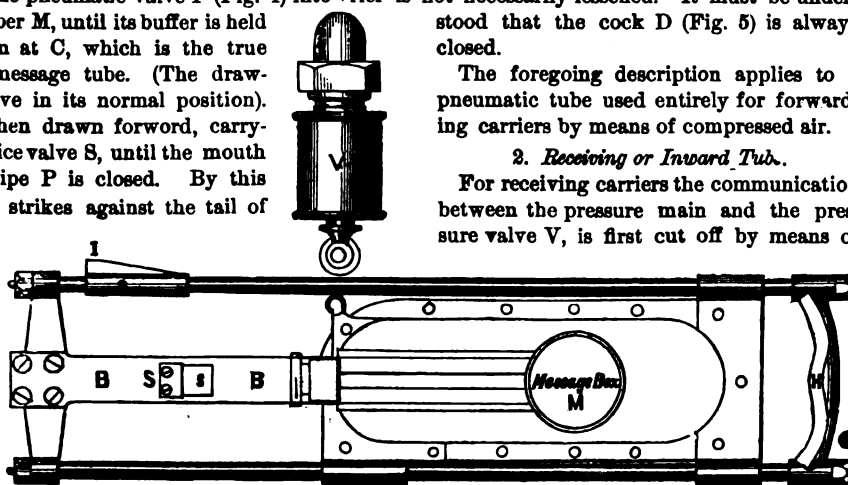


Figure 6.

a stop-cock fitted upon the tube E, but lower than is shown in the diagram. The handle H is then drawn forward, and the stop-cock D

opened, thereby establishing communication between the message pipe and the vacuum main. The carrier inserted at the distant end is then pushed forward by the atmospheric pressure, until it arrives in the message box M, and signals its arrival by the sharp noise caused by its striking the sluice valve S. The handle H is then pushed back, the stop-cock D having been previously closed; and, by the arrangement already described, the message pipe is closed by means of the sluice valve T (Fig. 4), and the bottom of the tube being open the carrier falls out of the message chamber M.

It will be remembered that before the admission of compressed air, the forwarded carriers are held at C. The buffers of the received carriers, however, having passed this point, the carriers rest free in the chamber M and drop out.

When the tube is used for a constant succession of carriers from the out station, it is necessary to pull forward the handle H, immediately after the taking out of any carrier. The short space of time occupied in this operation will not have any appreciable effect upon lessening the speed of the succeeding carrier. It will be seen, therefore, that a number of carriers may be continuously passing in succession through the tube. It is, however, undesirable to permit more than one carrier to be in transit at the same time.

*3. Tube working both ways.*

Where the traffic is not sufficient to warrant the expense of an "up" and a "down" tube, one tube only is worked in the following manner.

The top sluice T is entirely thrown out of use. This is done by removing the plug G. The rack R is then removed, and the sluice valve T drawn back, and is held in that position by a small clamp made for the purpose. The tube is then in its normal state for alternate traffic, and entirely open to the atmosphere.

*To forward a Carrier.*

The carrier is inserted in the message chamber as previously described, and the handle H drawn forward. The sluice valve S first closes the orifice P, after which the continuation of the motion opens the pressure valve, by means of the inclined plane on the slide-rod, and the carrier is forced to its destination. The handle H is, immediately on the arrival of the carrier being signalled, pushed back sufficiently far to remove the inclined plane from between the rollers, so as to close communication between the message pipe and the pressure main, but not far enough to remove the sluice valve from over the mouth of the message chamber. By this means the compressed air which remains in the pipe expands to the atmospheric pressure, through the distant end of the pipe only.

*To receive a Carrier.*

The cock D (Fig. 5) is opened, and a communication is thus established between the vacuum-main and the message pipe. The carrier is pushed forward from the distant end, as in the case of the continuous working, and signals its arrival by striking the sluice. The vacuum is then cut off by closing the cock D. On pushing back the handle the carrier falls out.

*Signalling.*

A system of electric signals is used between the central station and the outlying stations, consisting of a single stroke bell with indicator, to signal the departure and arrival of carriers, and for answering the necessary questions required in the working.

*Carriers.*

The carriers or "pistons" in which the messages are placed, are made of a cylindrical box of gutta-percha. A section of one of these carriers is shown

in Fig. 2. The shaded portion in this sketch represents the gutta-percha. This is covered with felt or druggut, which projects beyond the open end of the carrier, as shown at *ff*. This part expands by the pressure behind, causing it to fit the pipe exactly. The front of the carrier is provided with a buffer or piston *b*, which just fits the leaden pipe. This buffer is formed of several pieces of felt.

To prevent the messages getting out of the carrier, its end is closed by an elastic band *e*, which can be stretched sufficiently to allow the messages to be put in.

At the branch stations, where no apparatus is required, the message tube terminates with the end downwards, above the counter or table, so that nothing can fall into it by accident.

The following statement gives the time of the transit of carriers "outwards" and "inwards" in three of these tubes :

Station.	Time.				Length of Tube.
	Outwards.	Inwards.			
	min. sec.	min. sec.			yards.
Founder's Court.....	0 49	0 50			808
Baltic Coffee House....	1 23	1 29			1,192
Mark Lane.....	2 6	2 14			1,641

#### Material for Pipes.

Iron pipes, as well as lead, have been tried ; but the result of experience is greatly in favor of lead. No deterioration is experienced in the lead pipes, and they are easy to maintain. With the iron pipes, however, the case is different ; oxidation of the iron takes place, and, the interior becoming rough, the carriers are rapidly destroyed. The maintenance of an iron pipe is therefore found to be very expensive. In the new system carried out by the Department, lead tubes only were used.

Provided due care is exercised in the construction of the work, interruptions of the service are of very rare occurrence. When carriers occasionally stick fast in the pipes and cannot be moved either by compressing or exhausting the air, it is necessary to flood the pipe with water, and so force the carrier past the obstruction by an increased pressure.

All tubes are now fitted with a small pipe, by which water may be admitted if necessary.

Finally, the result attending the system of transmitting messages by means of the pneumatic tubes has been so satisfactory, that the Department has not only extended the system in the provincial towns, but has also, on the transfer of the central station from Telegraph street to the new General Post-Office, increased their total length from 12,570 yards to 31,009 yards, and their number from 14 to 26, with the probability of a still further extension.

**REPORT ON THE SYSTEM OF APPARATUS FOR LIGHTING THE GAS BURNERS IN THE HALL OF THE NATIONAL ASSEMBLY AT VERSAILLES.**—*M. Lissajous.*—The burners are lighted by electricity. A Ruhmkorff coil of medium size, with an automatic mercurial interruptor, is set in action by a Leclanché battery of four elements, the zincs having a surface of 4 square decimetres. These are only equivalent to three Bunsen elements of a middle size, but their duration is much greater. Under the influence of this battery the coil gives sparks of 15 centimetres. To transmit the electricity to the different lustres a special wire is employed for each, but the return current passes through one common wire.

#### DIRECTIONS FOR SETTING UP AND USING THE GRAVITY BATTERY.

Place the copper frame on the bottom of the glass jar, and fill it with sulphate of copper (blue vitriol) to the top of the copper. Fill the glass jar with water to within an inch and a half of the top of the jar. If you have any sulphate of zinc solution, taken from the porous cell of a Daniell Battery, or from the upper part of the cell of a Gravity Battery, put a gill of it in the jar. If you have none of this on hand put the same quantity of crystallized sulphate of zinc (white vitriol) in each cell.

Let the battery stand until the sulphate of copper and sulphate of zinc dissolve and separate. When the two solutions have properly separated the lower part of the jar will contain a blue fluid, and the upper part a nearly colorless or transparent fluid. After the separation of the two fluids (which will require about forty-eight hours), place the brass frame for holding the zinc on top of the glass jar, and suspend the zinc as near the top as possible. The zinc should always be suspended in the colorless or transparent fluid.

In case the zinc is placed in the jar before the two solutions have separated, copper will be deposited on the zinc, and the action of the battery be retarded. When such deposits take place the zincs should be removed, and cleaned with a stiff brush.

As the sulphate of copper becomes dissolved and consumed the blue solution will decrease, and the zinc should be lowered from time to time, so as to reduce the internal resistance.

When the water in the upper portion of the jar becomes saturated with sulphate of zinc, the sulphate crystallizes upon the zinc plate, stopping the action of the battery. The conducting power of a solution of sulphate of zinc is greatest when diluted with an equal quantity of water. Part of the solution, therefore, should be from time to time removed, and replaced by water. A syringe will be provided with each battery, for drawing off the sulphate of zinc solution from the upper part of the jar.

When crystals form on the top and sides of the cell, in consequence of the water being saturated with sulphate of zinc, they should be removed with a damp cloth. A little grease or fat, rubbed on the top and sides of the jar, near the top, will have a tendency to prevent the formation of crystals.

When all the sulphate of copper has been consumed the action ceases, and sulphate of zinc will be reduced upon the copper plate as a black powder. It is necessary, therefore, to provide a constant supply of sulphate of copper. Undissolved crystals of sulphate of copper should always remain in the bottom of the jar.

The jars should not be disturbed when in use, as this would cause the solution to mix. As the water evaporates from the jar it should be replenished by a fresh supply. Great care must be taken, in replenishing the jars, not to disturb the lower or sulphate of copper solution. A good way of preventing this is to gently pour the water into the jar through a sieve or sprinkler.

The electro-motive force of this battery is a little more than one-half that of the Grove or Carbon. Nearly double the number of cells will, therefore, be required to work the same wires.

Two sizes of the battery are made, known as number one and number two.

The number one cells are designed for local batteries, and for working from three to five main wires from the same battery. The number two cells are designed for working one or two main wires.

The Gravity Battery should be taken down and cleaned every four months.

The battery should be kept in a dry and comparatively warm place. The temperature of the battery room should never be allowed to approach the freezing point, as this would destroy its action.

#### THERMO-ELECTRIC BATTERIES.

The direct production of electricity from heat, and its utilization in practice as a source of power, has not been a commercial success. Unquestionably, says the *Journal of the Franklin Institute*, the best thermo-electric combination thus far obtained is that of Mr. Farmer, of Boston, in which an alloy of zinc and antimony constitutes the positive, and German silver or copper the negative plate. Such an arrangement was exhibited at the Paris Exposition in 1867, and excited great interest. The difficulty, however, in their use on the large scale lies in the fact that when in action they lose their activity rapidly, and "run down." Clamond has lately investigated the reason of this, and he finds it to be due to two causes : first, to the oxidation of the surfaces of contact of the two bars under the influence of the heat ; and second, to the cracking of the crystalline bar and its breaking into transverse sections. While, therefore, the electro-motive force of the apparatus undergoes no diminution, the internal resistance is so increased as to render the combination useless after a little time. The first of these difficulties Clamond has overcome by making some oblique cuts in the end of the flexible plate, and bending the intermediate tongues alternately to either side. When the melted metal is poured around this plate it flows into the spaces thus inclosed, and makes a more perfect contact. The second cause of deterioration was not so easily overcome. Annealing was found to be of no use, and it was finally ascertained that to render the bars homogeneous, crystallization must be prevented. This was effected by heating the molds in which the zinc-antimony bars were cast to a temperature near that at which the alloy fuses, and by pouring in the metal at a temperature near its solidifying point. In this way, using the zinc-antimony alloy in connection with strips of iron, the author has succeeded in constructing a thermo-electric generator, which remained in action in the laboratory of M. Jamin, at the Sorbonne, for six entire months without deterioration. This apparatus consisted of three rings, each composed of ten pairs of bars, arranged radially. In the interior cylindrical space was placed an earthenware tube, full of holes, serving as a gas burner. The entire apparatus weighed about 14 lbs., and at an expense per hour of six cubic feet of gas, costing in Paris one cent ; it deposited two-thirds of a troy ounce of copper, being equivalent to a Bunsen cell 7 in. high.

#### A NEW FORM OF GALVANOMETER.

A new form of galvanometer has been described by Prof. Guthrie in the October number of the *Philosophical Magazine*. In general form it looks somewhat like a common torsion-balance, and its principle depends upon the measurement of the strength of the current by determining the mechanical force necessary to bring two electro-magnets within a given distance of each other, after they have been excited by the current so as to be mutually repellant. By means of this instrument the absolute magneto-value of the current may be readily determined.



## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

Please give us your views as to the proper course to be pursued in the following case:

A message is received at a city office for a small office, after the closing time of such smaller office (10 A. M.), Sunday. Message desires a person to be at train at noon; is not received at office of destination till 5.20 P. M., and is sent collect. Inasmuch as the message is over five hours too late to accomplish the object sought, would it not be more to the credit of the Company not to have the message transmitted at all, or if transmitted, left undelivered at the receiving office.

MANAGER.

*Answer.*—The message should be delivered, but payment of the charges not exacted. When a message is accepted for transmission the Company agrees, simply, to forward it at the earliest moment possible, and to that extent only is it responsible. This message having been accepted, should be delivered. If by any fault in the service the message is rendered of no value, the remedy is plain, either non-collection or the refunding of the tolls. But it appears to us that the person who accepted this message on a Sunday, and who should have known the closing time of way offices, was grossly negligent—the message should have been taken only at the sender's risk, and it should have been prepaid.

The matter should be reported to the Superintendent for his action.

To the Editor of the Journal of the Telegraph:

Please answer the following and much oblige:

A party presents a message to Receiving Clerk, addressed to a place not laid down in the tariff book. The place is unknown to the clerk and he sends the following message:

To BROWN, New York. What's nearest office to

Signed,

MANAGER.

This same message was forwarded by the New York office to another office, who does not answer, but sends it to his superintendent as an "improper office message," and it is returned to the originating office, through his superintendent, as such.

*Query.*—Is it an improper message? if so what should be done in like cases? The Company do not furnish the office with a U. S. Gazetteer.

MANAGER.

*Answer.*—It is an improper message. The Company furnish their offices with a list of places for which messages may be taken. If a message is offered for a place not upon the list, it cannot be accepted without explicit directions as to delivery. It is no part of the duty of the Company to transmit messages without pay in order to supply customers with geographical information. But, at the same time, it is expected that employees will render to the public every facility possible to ensure a prompt delivery of this class of business, short of sending unpaid messages over the lines.

To the Editor of the Journal of the Telegraph:

Please give us some information on the following: My office is a joint North-Western and Western Union. The N. W. Telegraph Co. require all numbers transmitted, to be duplicated in figures; W. U. Co. forbid this, except the figures be counted and paid for. In repeating messages, am I to drop the figures in the one case and supply them in the other, or insist upon operators taking them as I have received them? Sometimes they object to this.

In charging for half-rate business, when half the

full rate is less than 25 cents, can we send the message at half rate and charge 25 cents, or must it be sent at full rate?

For instance: My tariff to a certain point is 40 cents; man wants to send message at half rate, which, in this case, would be 20 cents. As no charges are made less than 25 cents, should I send it at half rate and charge him 25 cents, or send at full rate and charge 40 cents? "D."

*Answer.*—You should carry out the regulations of the Company upon whose wires you may be working. As the Western Union Company do not allow of the transmission of figures in duplicate of words unless paid for, of course such figures cannot be sent over their lines.

The charge upon a half rate message of ten words or less to a point where the full rate is forty cents should be twenty-five cents. If there were thirteen words in the message the charge would no greater. It is optional with the customer and not with the manager whether the message should be sent at full or half rate. No half rate message, however, can be sent for less than twenty-five cents.

#### PROGRESS OF ENGLISH TELEGRAPHY IN 1874.

In summing up the progress of the telegraph in Great Britain during 1874, the *Railway News* says, that there have not been any great improvements introduced during the past year into the method of working the mechanism of telegraphy. This is the natural result of the monopoly of working having passed into the hands of the Government, when there is no encouragement held out either to the designer of new appliances or to the improver of old; whereas, so long as competition existed, each company was kept on the alert, so as to guard against the possibility of any other getting the start of them in the way of business. The organization of the Government system has, however, been greatly improved under the able management of Mr. Scudamore, and its advantages have been extended to almost every petty village in the kingdom which ranks as a post town. It might at first sight appear as if this was carrying the spirit of obliging a little too far, and there are perhaps some who will entertain the idea that the wants of the country, so far as telegraphy is concerned, would be amply met if none but the great towns were accommodated with an office for the receipt and dispatch of messages; but the returns show that the more the accommodation has been extended the more has the system come to be appreciated. Thus, in the first week of the past year the number of messages was 284,788, and last week they numbered 295,162.

In 1873 the average weekly increase on the returns of the previous year was about 25,000; last year they were about 32,000 as compared with those of 1873. Neither has there been any great progress made in respect to the rate of submarine telegraphy. It is true the fifth cable belonging to the Anglo-American Company was laid without flaw or hitch in the course of a few days, but then it was the Great Eastern, skilfully and ably officered and manned, which was engaged in the task, and we have got so accustomed to her achievements in that way, that, notwithstanding their character and grandeur, we have really ceased to wonder at them, and have come to regard them as matters of course. In sad contrast with this despatch and this success has been the abortive attempt, or rather series of attempts, made by the Faraday to lay the cable of the German speculators, who very hastily dubbed it the "United States Direct," and somewhat arrogantly claimed for

it the merit of being the great want of the age. While the Great Eastern did its work, as has been already said, in the course of a few days, the less fortunate Faraday has spent three-fourths of the year in the endeavor to lay the "Direct Cable," which has turned out one of the most unfortunate enterprises of the day.

Tusser, the poet, wrote the rules of good husbandry, but he never succeeded in anything which he undertook, and yet he ran through a whole gamut of employments. He was born under a threepenny planet, destined to be never worth a groat. There appear to be some enterprises born with a similar fatality, and the Direct Cable looks like one of them. Failure has attached to it at every stage of its career, and, looking to the origin of the scheme and the motives of its promoters, there are many who will feel disposed to echo the verdict of the Yorkshire jury—Served him right. This unfriendly feeling is not confined to the Anglo-American shareholders, who must, from time to time, expect to see others anxious to take part in the work in which they are engaged, inasmuch as competition is a natural incident of enterprise; those outside also entertain this feeling, because of the underhand manner in which the promoters of the scheme attempted first to deprive the Anglo-American of its well-earned privileges, and, failing in that, sought in the course of a "bearing" transaction, which is perhaps without a parallel in the history of the Stock Exchange, to frighten holders of Anglo-American stock to part with their property at a price far below its intrinsic value. The firmness and honesty of the Colonial Government defeated one portion of this plot, and the common sense of the country, which refused to credit the exaggerated statements made by the parties we have mentioned, has presented the complete realisation of the objects of the detraction of the Anglo-American Company.

#### BRAIN DEVELOPMENT.

Exercise of any bodily member develops and strengthens that member, perhaps making others appear dwindled and defective by contrast. The same rule holds with the mental faculties; one-sided culture makes one mind seem to be all memory another is all imagination; a third is all calculation; everything is counted, measured, weighed by him; the whole world is but a mass of statistics to such a one. Another is all tune; to him the ocean's roar is an anthem; the trees rustle and murmur as many different songs as the birds sing or the brooklet trills; the cataract is an organ-peal, and the "music of the spheres" is no figure of speech. Still another knows the form of things: the glowing masses of cloud are pictures of the "Transfiguration" or the golden chariots of Elijah; the uncertain moonlight gilds floating figures of Seraphim and Cherubim, satyrs and graces. Every figure and face shows the germ of a grand, heroic image; in every mass of marble is plainly discernible the possible Madonna, the Venus or Apollo. Though the other faculties in such minds may be fairly developed, they will seem dwarfed in contrast with the one predominant. For this reason extra pains should be taken to train the subordinate powers in such a mind, that the character may be more symmetrical. The dominant faculty will find means to grow without much fostering care.—*Phre nological Journal*.

We are all living too fast. The man who is always in a hurry generally has his own work to do over again, besides being more liable to trip up and find himself sprawling in the mud.

## TELEGRAPH MATTERS IN CENTRAL AMERICA.

[SPECIAL CORRESPONDENCE OF THE JOURNAL.]

ASPINWALL, Jan. 16, 1875.

The long pending suit between the contractors for the Colon Cable Company, the India Rubber and Gutta Percha and Telegraph Works Company and the West India and Panama Cable Company has been settled, and the Colon and Jamaica Cable will in future be worked by the latter Company.

This settlement will doubtless conduce to the greater efficiency of the service, and in increased satisfaction to the public.

J. A. M. Barrett, Esq., Superintendent of the Colon and Jamaica Cable, will probably retire from the management, which is to be regretted. To Mr. Barrett's energy and executive ability is largely due the present reliable and prompt system of communication. It is to be hoped that his successor will prove to be as capable.

No Southern news. The *Dacia*, with cable on board, had not arrived up to the sailing of the last steamer from Callao.

## THE WEST INDIA AND PANAMA COMPANY.

Mr. William Abbott states in his circular referring to this company that its shares, after a long period of depression, are at last attracting some attention. "The new directors are fairly entitled to the sympathy of the shareholders, inasmuch as the policy to which they have specially directed their attention, viz., the linking together of North and South America by the cables of the Central American Company, from Para to Demerara, has been most unfortunately delayed by a series of mishaps entirely beyond their control. A new cable was despatched from England in the steamship *Noraman*, and the shore end has now been successfully submerged. It is expected that the line from Demerara to Trinidad, and thence to Ponce, will be completed by the end of January, thus, if all goes well, telegraphic communication between Buenos Ayres and New York via the West India and Panama system, will be fully established by February next." He also states that the entry of the Brazilian, and Western Brazilian Companies into the list of dividend-paying securities is a very healthy sign, as it reduces to a comparatively small amount the extent of capital invested in submarine enterprise which is unproductive to the original subscriber. The new Black Sea cable promises well for its proprietors; this line unites Odessa to Constantinople; already the traffic is satisfactory, and it will no doubt in time considerably augment the revenue of the Eastern Company through the lines of their system in the Levant.

The following is a statement showing the total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending December 26th, and during the corresponding week of 1873: December 26, 1874, 295,162; December 27, 1873, 261,186—increase, 33,976.

The traffic receipts of the Eastern Telegraph Company for the month of December, 1874, amounted to £31,725, and for the month of December, 1873, to £35,238. A circular issued by the secretary gives a record for the last month of the latest dates of messages received from India, China and Australia, which shows that the cables are working with uniform speed and efficiency. The time occupied in the transit of messages has been—from Calcutta, 56 minutes; from Bombay, 54 minutes: "The comparative average of working speed of the Red

Sea and Indo-European routes between London and Calcutta, during the past official year, has been 4 hours 33 minutes by former (*via* Falmouth), and 4 hours 39 minutes by the latter. Increased efforts have been made to improve the speed and to attain a further degree of accuracy. The new recording instruments, worked by skilled English clerks, are used at all the stations between England and India.

The traffic receipts of the Great Northern Telegraph for the month of December last amounted to 294,338 fr., and for December, 1873, to 287,356 fr. The total traffic receipts for the year 1874 amounted to 4,427,890 fr. (£177,116), and for the year 1873 to 3,352,542 fr. (£134,102), showing an increase of 1,075,348 fr. (£43,014).

The traffic receipts of the Eastern Extension (Australasia and China) Telegraph for the month of December, 1874, amounted to £18,172, and for the corresponding month of 1873 to £20,400.

The receipts of the Submarine Telegraph Company for the month of December, 1874, amount to £7,895; the receipts for the corresponding month of the preceding year amounted to £7,933.

The directors of the Western and Brazilian Telegraph have declared an interim dividend of 5s. per share for the quarter ending December 31, 1874.

The traffic receipts of the Direct Spanish Telegraph amounted, for the month of December, 1874, to £1,271, against £1,224 in the month of November, 1874.

The Globe Telegraph and Trust Company have declared a dividend of 3s. per share upon the preference shares, being at the rate of 6 per cent. per annum, and of 2s. per share upon the ordinary shares, making, with previous quarterly payment a dividend at the rate of 5 per cent. per annum.

THE CHANNEL ISLANDS TELEGRAPH.—The steamship *International*, having taken on board from the tug *Victor* the necessary length of cable stores and appliances at Silvertown, proceeded to Dartmouth to take on board the electric cables of the Post-office and proceed direct for Guernsey. The various tests of the damaged cable have not as yet been very decisive of the nature of the fault in it, and it is improbable that anything definite will be arrived at until a further test shall have been taken from the Channel Islands side, although an impression is entertained that the fault is not very distant from Guernsey.

CUBA SUBMARINE TELEGRAPH.—The number of messages sent over the line during the month of December, 1874, was 2,073, estimated to produce about £2,300, as against 726 messages, which produced £742 in December, 1873.

## ELECTROPLATING ON CHINA.

M. Hansen has recently patented in France the following process for electroplating on a non-conducting material: Sulphur is dissolved in the oil of *Lavendula spica* to a syrupy consistence. Sesquichloride of gold or sesquichloride of platinum is then dissolved in sulphuric ether, and the two solutions are mingled under a gentle heat. The compound is next evaporated until of the thickness of ordinary paint, when it is applied with the brush to such portions of the china, glass, etc., as are desired to be covered with the electro-metallic deposit. The objects are baked in the usual way before immersion in the bath.

## THE ELECTROLYTIC PREPARATION OF MAGNETS.

The late Professor Jacobi proposed to determine experimentally whether, by proper arrangement, precipitated iron can be induced to arrange itself so as to form permanent magnets. The author maintains that he solved the question twelve years ago, and obtained magnets by electrolysis. He finds that iron precipitated from a solution of iron containing sal ammoniac is, in a very eminent degree, capable of permanent magnetism; that precipitated from other solutions of iron is magnetic only in a slighter degree. If the precipitate is obtained under the influence of powerful magnetism—prejudicial circumstances being avoided—strong magnets of homogeneous structure are formed from solution containing sal ammoniac. On the other hand, solutions free from sal ammoniac yield magnets distinguished by their irregular structure, in consequence of which the feeble magnetism of the precipitate is rendered still weaker.

A not unimportant degree of coercive power cannot, under any circumstances, be denied to iron, unless altered in its structure by ignition or other processes. The nature of the solutions themselves must be regarded as the cause of the irregularities of structure. While the sal-ammoniacal solution remains perfectly clear, a solid crystalline layer is separated upon its surface. If pieces are broken off, they fall to the bottom. Solutions of ferrous chloride become turbid, and continually deposit a slimy precipitate upon the electrodes. Klein's solution remains tolerably clear, but upon the surface is formed a slimy foam. If any of this falls down, the electrodes are likewise soiled. Thus the iron precipitate is deprived of its homogeneity, and by partial removal of the impurities—for example, by brushing and by the rise of gas bubbles—the formation of partial magnets is explained.—*W. Beetz, in Poggendorff's Annalen.*

DILATATIONS DUE TO ELECTRICITY.—M. H. Streintz has made a series of experiments on the increment of length in bars of different metals traversed by electric currents. He finds that the galvanic current produces no other modification in the elasticity of a conducting wire than that caused by the rise of temperature occasioned. Under the influence of a current a conductor expands more than if it had been raised to the same temperature without the current. To this rule tempered steel forms the only exception. Galvanic expansion does not show itself immediately when the circuit is made, but gradually like the expansion occasioned by heat. Galvanic expansion does not appear to be the consequence of an electro-dynamic repulsion, but results rather from a polarization of heat, or a change of direction of the calorific vibrations.

As an illustration of the speed at which the electric current travels, a message sent from the observatory of Harvard College direct to San Francisco and back by way of Canada, over thirteen railways, was only two-thirds of a second. As an instance of how small a current is required, it may be mentioned that it is recorded that a conversation took place between electricians at Valencia and Newfoundland, through two of the Atlantic cables joined at the ends, forming a circuit of 4,320 miles in length, using a battery composed of a percussion gun-cap containing a morsel of zinc and a drop of acidulated water. The transmission time of the cable between Valencia and Newfoundland is three-tenths of a second; of that between Brest and St. Pierre two-thirds of a second nearly.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
195 Broadway, New York, February 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Pryor's Sta., Ga., re-opened.  
Crawford, Crawford Co., Mich., closed.  
Franklin, Mo., changed to Pacific City.  
A W. U. office now open at Waretown, N. J., square 47; check direct.

On and after February first, the tariff to Brooklyn, L. I., N. Y., (including Williamsburg, So. Brooklyn and Greenpoint,) and Flatbush, L. I., N. Y., will be the Western Union "Local rates from offices within 50 miles, and 10 cents added to the rate to New York City from all other offices except those on Long Island.

The Long Island Offices will charge as heretofore. The additional "10 cents" to Brooklyn and Flatbush, will not be charged by offices having a State rate to New York.

The tariff to Harlem, Yorkville and Manhattanville, N. Y., in square 41, which has heretofore been 15, and 1 in addition to the New York City rate, will hereafter be the "Local" square or State rates found, as the rates are to other W. U. Offices. Business for Harlem, Yorkville and Manhattanville, will be checked to New York as at present.

"Local rates" referred to above are as follows:  
"25 cents for air line distances not over twenty-five miles, and "30 cents for air line distances of over twenty-five, but not over fifty miles.

Messages taken for Roscoe, O., are delivered from Coshocton Charges for delivery, twenty-five cents.

The P. O. address of Big Walnut, O., is Taylor Station, Franklin Co.

The P. O. address of Pendleton, O., is Pendleton Station, Cincinnati.

Carpenters, Gilletts and Roaring Branch, Pa., are now other line offices. "Tariff for other lines" to each is 40 and 3 from Elmira, N. Y., or Williamsport, Pa.

Altman's S. C., closed.

Millet's Station, Station, S. C., re-opened

Messages taken for the Female Academy at Mt. De Chantal, near Wheeling W. Va., are delivered from Wheeling. The charge for delivery, which must be prepaid, is one dollar.

## NEW OFFICES.

Farmington, Cal.

Olema, "

Tomales, "

Woodbridge, "

327 Dunham, Ill.

347 Farmdale, Ill.

318 Hammond, Ill.

336 Mineral, Ill.

347 Morton, Tazewell Co., Ill.

327 Waynesville, Ill.

317 Seneca, Ill.

263 Henryville, Ind.

290 Medaryville, Ind.

243 Versailles, Ky.

\* Bastrop, La., 50 4 408 Monroe.

Half-rate messages may be taken for, and received from Bastrop, La.

260 Bloomingdale, Mich.

260 Hudsonville, Mich.

260 Kendalls, Mich.

260 South Haven, Mich.

\* Mallory, N. Y., 35 3 74 Syracuse

180 Columbia, Ohio.

170 Philadelphia Roads, O., P. O. A., Station 15, Harrison Co.

369 Pacific City, Mo., (formerly Franklin).

151 Ingram, Pa.; check Mansfield.

122 Keystone, Pa.

151 Nimick, Pa.; check Mansfield.  
151 Temperanceville, Pa.; check Mansfield.  
428 Flatonia, Texas.  
151 Collier's, W. Va., P. O. A., Pan Handle.

## ATLANTIC CABLE BUSINESS.

We are notified that the cable communication "via Santander" is at present interrupted.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, Jan. 19th, 1875.

## Executive Order, No. 159.

1. The Sixth District of the Southern Division is hereby consolidated with the Second District of the Central Division, and placed in charge of Sup't. R. C. Clowry, St. Louis, Mo.

2. Sup't. Clowry is hereby appointed Ass't. Gen'l. Sup't. of the Central Division, and will report to this office direct touching matters within the district assigned to him.

3. The Eighth District of the Eastern Division, Sup't. D. H. Bates, and the Tenth District, Sup't. A. G. Davis, are hereby transferred to the Southern Division, and will be designated respectively the Sixth and Seventh Districts of the Southern Division.

4. The headquarters of the Southern Division will be removed from Louisville to New York. Gen'l. Supt. Van Horne remaining in charge as heretofore.

5. The Seventh and Ninth Districts of the Eastern Division, Supts. Gifford and Holmes, are hereby transferred to the Central Division, and will be designated respectively as the Eighth and Ninth Districts of the Central Division.

6. Supt. J. C. Hinchman is hereby appointed Ass't. Gen'l. Supt. of the Eastern Division.

7. The Sixth District of the Eastern Division is hereby consolidated with the First District, and assigned to Mr. A. S. Brown, who is hereby appointed District Supt.

8. All reports for the current month will be forwarded in the same manner as heretofore, and without regard to the foregoing changes.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
NEW YORK, Jan. 29, 1875.

On February 1st, the following named Money Order Offices in D. Flanery's district will be transferred to C. G. Meriwether's district:

Franklin, Louisiana.

Lake Charles, "

New Orleans, "

New Iberia, "

On the same date Mr. James Compton, of Jackson, Miss., will assume control, as Transfer Agent, of the remaining Money Order Offices in D. Flanery's district, viz.:

Baton Rouge, La.

Canton, Mississippi.

Holly Springs, "

Jackson, "

Natchez, "

Port Gibson, "

Vicksburg, "

Woodville, "

GEO. H. MUMFORD,  
Vice-President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, January 29th

The Complimentary Franks issued by this Company during the year 1874, and now in force, are hereby extended until the first day of March.

GEO. H. MUMFORD,  
Vice Pres't.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

RECEIPT OF ASSESSMENTS—NEW YORK, JAN. 25, 1875.

## ASSESSMENT No. 71.

17, 22, 51, 58, 280, 350, 381, 398, 414, 428, 481, 527, 551, 605, 617, 652, 667, 671, 717, 725, 801, 869, 899, 908, 920, 934, 1108, 1148, 1207, 1251, 1336, 1437, 1488, 1516, 1559, 1584, 1572, 1600, 1603, 1605, 1607, 1608, 1609, 1610, 1611, 1612, 1636, 1637, 1639, 1653, 1655, 1657, 1672, 1690, 1691, 1698, 1729, 1773, 1818, 1835, 1917, 1931, 1984, 1983, 1984, 1984, 1988, 1978, 1995, 2005, 2118, 2128, 2145, 2160, 2179, 2244, 2280, 2302.

## MISCELLANEOUS.

69.—1149.

68.—19, 800.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## OBITUARY.

HENRY HIGHTON.

The Rev. Henry Highton, a gentleman long and well known in scientific, telegraphic and scholastic circles, died very suddenly in December last, at his residence in The Cedars, Putney, England. The Telegraphic Journal of January 1st contains a history of Mr. Highton's contributions to scientific knowledge, from which we make the following extract:

As a scientific man Mr. Highton is associated with various discoveries in connection with electrical telegraphy, for which he more than once received a medal from the Society of Arts. He took out his first patent as early as July, 1844, for a telegraph worked by static electricity and a chemical recorder. In 1846 he invented his well-known gold-leaf telegraph, which, however, was never practically used. A small strip of gold leaf inserted in a glass tube was made to form part of the line circuit, and it was placed between the poles of a large permanent magnet. Whenever the line currents passed through the gold leaf it was instantly moved to the right or left, according to the direction of the current. Its delicacy is so great that efforts have been recently made to introduce it upon our long-cable circuits. In 1848 he took out a patent, with his brother Edward, for a new form of needle telegraph and various other modifications; and in 1850 the British Electric Telegraph Company was formed for the express purpose of working and bringing into more general use the inventions of Messrs. H. and E. Highton. He recently (1872-3) introduced a new form of battery, and has been engaged in perfecting a mode of working long submarine cables by means of his gold-leaf receiver, and a new electromagnetic induction apparatus, by which the sensitiveness of telegraph instruments is considerably increased. He also, some years ago, invented and perfected a new kind of artificial stone, now largely used for paving and building purposes. Mr. H. Highton was formerly elected a Mitchell Fellow of Queen's College, Oxford, after highly distinguishing himself in both the classical and mathematical class lists of that University. He was a candidate for the Head Mastership of Rugby at the period of Dr. Hayman's election.



## INDUCED CURRENTS AND DERIVED CIRCUITS.

BY SAMUEL E. PHILLIPS, JUN.

In the "Journal of the Society of Telegraph Engineers" I have recently noticed an article with the above heading, extracted from "Silliman's American Journal," in which the writer, Mr. John Trowbridge, seems under the impression that the law of derived circuits, as ordinarily understood, does not apply to induced currents; and after giving some data, in which several important items are missing, he concludes by saying: "From the above it appears that, under certain conditions, an induced current does not divide according to the laws of derived circuits, but approximates to these laws when there is a resistance exterior to the galvanometer, which is appreciable in comparison with that of the galvanometer." This is doubtless a very startling statement in itself, and, being copied from one journal into another, may mislead many who let it pass unchallenged. A little consideration of the figures given will, however, soon make the matter clear, and leave us in full possession of the laws attacked, and of their universal application.

In dealing with derived circuits, Mr. Trowbridge would seem to ignore the fact that for every alteration in the combined resistance—such as the variations in the shunts of a galvanometer—the total resistance in circuit is altered, and, consequently, we have not the same quantity of current flowing in any two cases. The electromotive force being constant, and the internal resistance of the electromotor (whether battery or coil) being so small that it may be disregarded, then it is easy to see that with any shunt we shall in all cases obtain about the same deflection on the galvanometer, a constant deflection in the case of a battery, or an impulse of constant force when dealing with an induced current. The laws of derived circuits apply with equal exactness in each case: this we can clearly show by Mr. Trowbridge's own figures, although he draws a contrary inference from them. He says: "A reflecting galvanometer of large resistance was included in the secondary circuit, and connected by copper wires of very small resistance with the coil in which the secondary currents are produced: *the resistance of these wires was infinitesimal in comparison with the resistance of the galvanometer.*" This is somewhat vague, for it would lead one to suppose that it was only the leading wires which had an infinitesimal resistance in comparison with the galvanometer, and that he had omitted to mention the resistance of the secondary circuit in which the induced current was produced; and one might naturally picture the secondary circuit of an induction coil as the source of current, in which case there would ordinarily be a considerable resistance involved; but a glance at the figures show that this was not the case, and that the infinitesimally small resistance included both the leading wires and the coil under induction; and a little later this is further indicated, for the writer says: "With an inappreciable resistance outside the galvanometer coils, the shunts made no difference in the deflection of the galvanometer needle when the shunts were not less than 3 ohms; below this the current divided!"—the last five words conveying the idea that previously no division had taken place, which is later on contradicted, in instantiating one galvanometer shunted by another galvanometer of the same resistance, the same deflection being obtained on each, when joined as a parallel circuit, as upon one alone. How Mr. Trowbridge could have come to this last result, and not have seen the true bearing of the case, it is hard to understand. With his gal-

vanometer of 5880 units resistance he obtains a deflection of 210 divisions, the resistance external to the galvanometer practically equalling 0. And we may express it thus, E being the electromotive force of the induced current—

$$\frac{E}{5880} = 210 \text{ divisions.}$$

On shunting the galvanometer with an equal resistance we have—

$$\frac{E}{5880 \times 5880} = \frac{E}{2940} = 420 \text{ divisions;}$$

$$5880 + 5880$$

or, having halved the total resistance in circuit, we get a current of double quantity, which, having two equal channels to flow through, divides into two halves, 210 going through the galvanometer, as in the first case when no shunt was employed, and 210 by the shunt; whereas Mr. Trowbridge would seem to infer that, had the law of divided circuits been correct, we should have obtained only 105 divisions, which would have been quite true if we had been simply dealing with a given amount of current in

the several cases. We therefore see that  $Q = \frac{E}{R}$  is a perfectly correct expression to use in connection with an induced current, and that, having by this equation correctly estimated the amount of current in each case, it is found to divide strictly according to the law of derived circuits.

Mr. Trowbridge next goes on to show that with only small added external resistances—such as 10, 20, 30, 40—the galvanometer being shunted with 588 units, and consequently having a combined resistance of 534.55 units in each case, he still obtains 210 divisions, and the shunt of 588 ohms has no effect. Here there is a departure from the values we should predict, following our previous simple estimate of the case; they are, however, not great, and in the absence of all instrumental data I should be inclined to consider the theoretical values correct, and the departure from them to be due to errors in the method of making the investigation. In the first case we have—

$$\frac{E}{5880 + 10} = 210,$$

and with a shunt introduced—

$$\frac{E}{\frac{5880 \times 5880}{5880 + 5880} + 10} = \frac{E}{2950} = 22676,$$

which dividing inversely between the galvanometer and shunt, we should have 206 pass through the former, and not 210 as stated. On adding 100 units external resistance, the table gives the deflection as 190 instead of 210, whereas calculation similar to the above would give us the following values:

$$\frac{E}{5880 \times 588} + 100 = 177 \text{ divisions on the galvanometer instead of the 190 given.}$$

Mr. Trowbridge then adds, that—"We see from this that no effect is produced by the shunt until the exterior resistance was appreciable in comparison with that of the galvanometer." We can only remark, of course not! And we have already shown that, with an exterior resistance of 0, the shunt has absolutely no effect on the current flowing through the galvanometer, but the moment we have external resistance, the shunt begins to produce a reduction in the current passing through the galvanometer; as in the case of the 10 added units of external resistance, 206 divisions would have been obtained

instead of 210, although Mr. Trowbridge's arrangement did not seem to appreciate such small differences. We may, in this way, go on increasing the external resistance until any shunting of the galvanometer alters the total resistance in circuit, by so small an amount that the deflections become practically quite proportional to the two resistances. Mr. Trowbridge then gives a table to show the effect of considerable external resistances, such as 1500, 2000, 2500, 3000 ohms, and so on up to 5000. I have endeavored to understand the construction of this table, but have quite failed to trace the relative values given, and will simply quote the paragraph that follows: "It will be seen, by comparison, that with large external resistances exterior to the galvanometer resistance, and appreciable in connection with it, the laws of the division of currents practically hold, and as the exterior resistance approaches that of the galvanometer, the coincidence of the laws is more marked!" We would rather say: The laws of derived circuits apply with equal exactness to continuous voltaic currents and to currents due to induction. In the latter case, as in the former when the external resistance is inappreciable with that of the galvanometer, the current flowing in the galvanometer is unaffected by a shunt; when the external resistance is appreciable in connection with the galvanometer resistance, the effect of the shunt becomes visible, and the more we increase this external resistance the more proportional do the deflections become, until, with infinite external resistance, they would be exactly so, and a given current—whether voltaic or induced—would divide between the two circuits in the exact inverse ratio of their resistances, provided the two wires were placed under exactly the same conditions. If this latter were not the case, a small apparent departure from the law might take place, as instanced in a paper read before the Society of Telegraph Engineers, by Mr. Latimer Clark, in which it is pointed out that when a galvanometer is shunted a given momentary current does not divide exactly in the inverse ratio of the two resistances. We could also imagine a similar apparently abnormal result in two circuits, one of which was laid out straight and the other coiled up on a bobbin—but these are refinements beyond the field of Mr. Trowbridge's somewhat sweeping discovery; but even with them we would suggest that the law, in its widest bearing, is still perfectly correct, for in the first case the apparently abnormal result is due to an opposite current, being set up in the galvanometer coil by the swing of the needle, and so the primary current is retarded in this part of the circuit, and the shunt carries more than its due share; so in the case of the straight and the coiled wire, there would be an inductive action between the coils of the wire on the bobbin, which we can imagine would prevent an exactly equal division of a given momentary current, although their two resistances might with other conditions be equal; and it would surely be unfair, on this account, to say the simple law is incorrect: let us rather adhere to it, and then when we meet with any difficulty—such as suggested above—we should be led to look for some external cause, and should in all cases doubtless find one to exist.—*The Telegraphic Journal.*

**ELECTRO-STATIC INDUCTION CURRENTS.**—*M. Nery-reneuf.*—Verdet and Masson have made use of the electric egg to determine the direction of the induced current. The author has repeated their experiments, making use of the discharge of a Holtz machine, and has established without difficulty that the direction of the induced current varies with the intensity of the inducing charge.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

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Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

145 Broadway, New York.

NEW YORK, FEBRUARY 1, 1875.

### IMPORTANT CHANGES.

Executive Order No. 159 will be found on page 38. The order involves some important changes in the departments of the superintendents. The lines east of New York are detached from those south, and form a division under the general superintendency of Vice-President Mumford. Superintendent Hinchman of the New York District is appointed Assistant General Superintendent of the Eastern Division, and Superintendent Clowry of the St. Louis District, Assistant General Superintendent of the Central Division. The first and sixth districts of the Eastern Division are consolidated, with Manager Brown of the New York office as superintendent, succeeding Messrs. Hinchman and Chandler. The lines between New York and Washington and the South, are placed in charge of General Superintendent Van Horne, whose headquarters will hereafter be in New York City. The Baltimore and Ohio District is also placed in the Southern Division, while the Erie District, and the lines to Texas, west of the Mississippi River, are added to Gen. Stager's division. The lines from Buffalo to Albany are also transferred to the Central Division.

Nearly all of the departments of the Western Union Company have, as we write, been removed from the old Telegraph building, No. 145 Broadway, and are now located in the Company's magnificent edifice on Broadway and Dey street. The Receiving and the Operating departments will be the last to occupy the new quarters, and on Monday, February 1st, the whole of the Company's service will be conducted from the new building. As we go to press before that time, our readers must remain content with this brief announcement, but with the next number of the JOURNAL we shall present our subscribers with an elegant illustration on tinted paper, and a full description and history of the new building, which is one of the grandest in the country devoted to private business pursuits.

### REORGANIZATION.

For a long time past the executive officers of the Western Union Company have been impressed with the fact that the organization of their service would be improved by the districting of their lines into divisions and districts more in harmony with the current of business continuously passing in given directions, rather than in the geographical ranges in which, until now, the lines have been divided. For various reasons, not necessary to detail, the matter was deferred, but the fortunate changes which have recently occurred have now afforded an opportunity to carry this important design into effect.

As will be seen by the Executive order which appears on another page of this issue, that portion of the lines of the Company covering the territory east of the Mississippi River has been subdivided in such a manner as to bring those points under one management which have, telegraphically considered, the greatest business intimacy. This arrangement will, doubtless, greatly facilitate the transaction of business.

In days long gone by it was a proud boast of the Romans that all roads led to Rome. So it is now in America—all the lines lead to New York as the common center—the very heart of the telegraphic business of the country. Extending from New York City, the volume of telegraph business has created three distinct divisions, as clearly defined as the natural course of a river, within each of which messages flow with the undeviating regularity of the Gulf Stream. One current sweeps a wide path to the far distant Pacific, with midway branches north, over the lakes, and south, down the Mississippi, to where it receives the waters of the Ohio. Another current flows down the Atlantic coast to the Gulf, and is diffused generally over the South and South-Western States. Eastward, the current of business is no less marked, the cohesion of which constitutes a peculiarity which is recognized, and henceforth the lines east and north-east of New York will form a separate and distinct division.

It is expected and believed that these changes will effect a great improvement in the transaction of the telegraphic business. It is a matter of public import, for the telegraph has become so interwoven with the commercial and social interests of the country, that any change involving a forward movement will surely be greeted with satisfaction and pleasure by the community at large.

### THE TELEGRAPHERS' BALL.

The first annual invitation ball of the New York Telegraphers' Association which is set down for February 4th, at Ferrero's Assembly Rooms in this city, promises to be a very enjoyable affair. The committee who have charge of the arrangements will spare no effort to cause the evening to pass pleasantly, and as they are gentlemen of courtesy and of much experience in matters of this kind, their success is not problematical.

### A STEP IN THE RIGHT DIRECTION.

The telegraph operators of Milwaukee have taken a step in the right direction in forming an association for the purpose of pursuing a thorough course of study in matters relating to the telegraphic art. Mr. C. H. Haskins, the General Superintendent of the North Western Telegraph Company, who is an electrician of considerable experience, is the President of the Association, and he has kindly consented to deliver weekly lectures before the Society. The Vice-President is Mr. A. Earling; the Secretary Mr. W. G. Collins, and the Treasurer, Mr. A. Weller, Manager of the Western Union Telegraph office in that city.

This is the first practical movement in the direction inaugurated at Chicago, last September, in the organization of the American Electrical Society, and we hope to be able to record the formation of similar associations for mutual advancement in every one of the principal cities of the Union. The Milwaukee papers speak very encouragingly of the young society. In a congratulatory article, the *Commercial Times* of that city says:

Telegraphy has made such unprecedented progress during the past few years that it is now considered a distinct branch of engineering. In most European countries no person can obtain the management of a telegraph office without first passing a thorough examination in electricity, magnetism and language. Competent persons are thus secured and inaccurate messages are rarely sent. The telegraph companies in America are doing all in their power for the advancement and diffusion of knowledge pertaining to electricity among their employees; and we are especially pleased to note that the operators are taking steps to forward such measures. Success to the society of Telegraph Operators.

### A HEALTHY OFFICE.

There is nothing which so clearly indicates skillful management as the arrangement of the staff of an office to the work performed, so that on the one hand labor may not be oppressive, or on the other too diffused. We have before us the statistics of an office of this description, which we give partly as illustrating a healthy management and partly to show the amazing advance of one of our young Western cities, which but a few years ago struggled for existence, and seemed likely at one time to be buried beneath the savage warfare then so prevalent.

Kansas City, Mo., ten years ago had a population of about 4,000. It has now 40,000. The following is the telegraphic work done therein during the month of December:

Number of messages handled .....	30,441
Reports and specials, 106,997 words, reduced to message basis .....	5,349
Total number of messages .....	35,790
Number of operators, including chief .....	7
Daily average messages to each operator .....	204

## A CASE OF MISFORTUNE.

## ACKNOWLEDGMENT OF CONTRIBUTIONS.

The Editor of the JOURNAL has great pleasure in acknowledging the receipt of the sums of money given below for the relief of the distressed operator and his family, for whom an appeal was made in the last issue of the paper. The sympathetic character of every letter which has come to hand is very cheering evidence of the fraternal feeling existing in the brotherhood of American telegraphists:

C. B. Clarke.....	\$1 00	Jas. A. Storer....	\$1 00
Opr. ....	2 00	E. M. R. ....	1 00
J. W. Callaway..	1 00	G. E. Manley....	1 00
A Sister Operator	1 00	M. M. Riffin....	50
Two City Offices..	4 50	J. C. Mould ....	1 00
Hardcase .....	1 00	G. ....	2 00
C. A. S. ....	1 00	J. W. S. ....	2 00
W. O. ....	2 00	W. J. I. ....	1 00
G. B. P. ....	2 00	C. P. Philbrick..	2 00
		H. G. Sedgwick..	1 00

Received through Mr. Wm. Holmes:

John Mathews....	\$5 00	40 Operators in N.	
W. H. Parsons..	50	Y. Main Office..	20 00
Louisville City		D. P. Livermore..	5 00
Operators.....	17 00	A. H. Watson....	1 00
Opr. ....	2 00	M. B. Hills....	1 00
One of the W. U.		W. G. Magowan..	50
boys.....	1 00	D. H. Snow....	1 00
Portly John....	1 00	H. Cordes.....	1 00
S. M. Pearson....	1 00	316.....	1 00
A. T. ....	1 00	Stephen Lawrence	2 00
659.....	1 00	Emma F. Law-	
W. H. Annis....	2 00	rence.....	2 00
Mary Ida Fisher.	1 00	D. C. McVean....	50
Cleveland, Office.	20 00	M. W. Tandy....	1 00
W. A. Pillow....	1 50	Buffalo Office....	27 50
Pittsburgh Office.	43 50	L. D. Kemp.....	25
Rankin, Ill. ....	1 00	J. Swan.....	1 00
S. S. Thompson..	1 00		

## TINKERING AT THE TELEGRAPH IN OHIO.

In the Ohio Legislature, on Jan. 22d, a bill was introduced to regulate telegraph companies, and to fix a scale of charges which run from 20 cents for 10 words for 50 miles or less, to 50 cents for 10 words for over 400 miles, and 10 cents for each additional 100 miles. Violations of this act make the companies liable for not less than \$100 damages for each offense. The bill also requires the different telegraph companies to pro-rate with each other.

## A HIGH TELEGRAPH POLE.

The tallest and largest telegraph pole in New York, perhaps in the world, was raised in Fulton street, near St. Paul's Church, on January 17th. It is to be used to support the distributing wires that will extend from the new building of the Western Union Telegraph Company at Dey street and Broadway. The pole is 93 feet long and two feet in diameter, and reaches high above the neighboring buildings. The raising required the labor of a large number of men and two horses and completely blocked the street for some time. The tree from which the pole was made was of Californian growth.

## ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from page 26.)

MINUTES OF EVIDENCE TAKEN BEFORE THE COMMITTEE FRIDAY JULY 10, 1868.

The Chancellor of the Exchequer in the chair.

The CHAIRMAN. You put your maximum estimate of revenue at £358,000?

Mr. SCUDAMORE. I did.

The CHAIRMAN. You could raise with that revenue, at 3½ per cent., the sum of £10,000,000?

Mr. SCUDAMORE. You could.

The CHAIRMAN. You stated your medium estimate, half-way between your maximum and minimum, at £280,000?

Mr. SCUDAMORE. I did.

The CHAIRMAN. You could raise on that, at 3½ per cent., £8,000,000?

Mr. SCUDAMORE. Yes.

The CHAIRMAN. What I mean is this, that £358,000 in the one case, and £280,000 in the other, would suffice to pay 3½ per cent. interest, in the one case on a capital of £10,000,000, and in the other on a capital of £8,000,000.

Mr. SCUDAMORE. Yes.

The CHAIRMAN. With regard to your minimum estimate. Your minimum estimate was £203,000?

Mr. SCUDAMORE. Yes.

The CHAIRMAN. A little over that, namely, £210,000 would suffice to pay interest at 3½ per cent. on £6,000,000?

Mr. SCUDAMORE. It would.

The CHAIRMAN. Without going into particulars, do you conceive that the total sum required for the purchase of all the interest agreed to be purchased will, in any case, amount to more than the sum of £6,000,000?

Mr. SCUDAMORE. I do not think that the purchase of all the interests, including those even which are not represented in the estimate of revenue, would amount to £6,000,000.

The CHAIRMAN. So that even supposing it should amount to £6,000,000, taking your medium estimate, there would be £2,000,000 to spare?

Mr. SCUDAMORE. Yes.

The CHAIRMAN. Taking your maximum estimate, there would be £4,000,000 to spare?

Mr. POTTER. Supposing you pay £6,000,000, £4,000,000 will be paid in premium for good will?

Mr. SCUDAMORE. I can hardly answer that.

Mr. POTTER. About that?

Mr. SCUDAMORE. I can hardly answer that question.

Mr. GOSCHEN. The aggregate, you say, would not exceed £6,000,000. Do you think under any circumstances whatever your £2,400,000—your original estimate—can run up to £6,000,000?

Mr. SCUDAMORE. Yes; I think it can.

Mr. GOSCHEN. The value of the property seems to have risen upon you from two millions and a half to six millions?

Mr. SCUDAMORE. My original estimate allowed nothing whatever for good-will.

Mr. GOSCHEN. Your original estimate was based upon the value of the property; your original estimate allowed something for good-will, did it not?

Mr. SCUDAMORE. No, not a farthing. It merely allowed for the assets of the companies.

Mr. GOSCHEN. Will you turn to the page in your book in which you state that that sum of £2,400,000, your original estimate, was for the assets of the company?

Mr. SCUDAMORE. My original report contained documents not in it now, and which showed that it was for the assets of the companies.

Mr. GOSCHEN. You have never stated, in any of the reports you have sent in, that it was based upon the assets of the company?

Mr. SCUDAMORE. Not in plain words.

Mr. GOSCHEN. Will you turn to the page in your report where you deal with the £2,400,000, and see what you have said there?

Mr. SCUDAMORE reads: "For obvious reasons, I do not propose now to offer any opinion as to the precise price which would have to be paid for the business of each company; but looking, on the one hand, to the earnings, past and present, of the companies, and, on the other hand, to their past and present outlay, and to the regular

depreciation to which their property is subject, and looking also to the estimation in which their property is held by the public, and which is shown in the market-value of their shares, I have come to the conclusion that the whole of their property and rights of every description might be purchased for a sum within £2,400,000."

Mr. GOSCHEN. After reading that, do you maintain that you merely spoke of the assets of the company in making that calculation?

Mr. SCUDAMORE. I say that I have allowed nothing for good-will.

Mr. GOSCHEN. What are "rights of every description?"

Mr. SCUDAMORE. I have not included in that term certainly good-will. I have made no allowance whatever for compulsory sale, and have made no allowance for prospective profits.

Mr. GOSCHEN. You have looked to the market value of their shares?

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. According to that, if the market value of the property was two and a half millions at that time, and we now run up to £6,000,000, you are paying more than 100 per cent. above the market price at that time?

Mr. SCUDAMORE. Above the market price of that time I will not say 100 per cent., but something considerably above the market price.

Mr. GOSCHEN. Does not the value of the shares represent, more or less, the good-will as well as the dividend?

Mr. SCUDAMORE. No; I do not think it does.

Mr. GOSCHEN. Do you mean to say that the value of the shares merely represents the assets of the property when there is a good business being done?

Mr. SCUDAMORE. There are many cases, no doubt, in which the value of the property is not represented by the value of the shares in the market.

Mr. GOSCHEN. You think that those who buy shares consider that they are merely buying the posts and wires, but not buying the good-will and existing contract?

Mr. SCUDAMORE. No; I do not say that.

After further questions by Mr. GOSCHEN and replies by Mr. SCUDAMORE, the Chairman put several questions touching the increase in Mr. Scudamore's figures, both as to the cost of the lines to be acquired and the prospective net revenue.

The CHAIRMAN. At the time the bill was sent to a select committee, you had raised your estimate of the amount that would be required for the purchase?

Mr. SCUDAMORE. Yes.

The CHAIRMAN. Do you remember to what amount?

Mr. SCUDAMORE. It was raised to £3,600,000; that is, the property represented by the two and a half millions had in my estimation risen to £3,600,000.

The CHAIRMAN. That was in addition to the sum which you thought would be required for extensions?

Mr. SCUDAMORE. Yes.

The CHAIRMAN. I understand you to say that you put £6,000,000 as the very outside figure?

Mr. SCUDAMORE. As the outside figure.

The CHAIRMAN. And you do not go into greater details in order not to give information to the companies, that they may use before the arbitrator?

Mr. SCUDAMORE. Yes.

The CHAIRMAN. Therefore we are not to take £6,000,000 as your present estimate, but as the outside figure?

Mr. SCUDAMORE. As the outside figure.

Various questions are put to Mr. Scudamore respecting the increase in his estimates; the arrangements with the companies to be bought out; the cost of working foreign telegraph lines, as compared with the English; to which replies are made, Mr. Scudamore stating that the English lines expended only £339,000 in 1867.

Mr. GOSCHEN. Have you made any further inquiry as to the cost of repairs and maintenance of line, &c.

Mr. SCUDAMORE. I have taken out the maintenance and repairs from the accounts which you have got this morning, and out of the £330,000 I see that £91,000 is set down for maintenance and repairs of land lines; that does not include anything for the cables.

Mr. GOSCHEN. Then I think in your maximum, or in your most favorable estimate, you make the working expenditures about £360,000?



Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. And in your minimum estimate you make the expenditure £291,000?

Mr. SCUDAMORE. Yes; there being no provision there for increase of business, as no increase of business is taken for granted.

Mr. GOSCHEN. But I think you admitted yesterday that there ought to be an addition to that, because you have not calculated the increase in the business from the cost of sending six million telegrams to the cost of sending seven and a half millions.

Mr. SCUDAMORE. If I made any addition it would be a very small one indeed.

Mr. GOSCHEN. Do you think that it would be £25,000?

Mr. SCUDAMORE. That would be a great deal to much.

Mr. GOSCHEN. Then you stand by those calculations and you think that we may take it from you, that you have gone thoroughly into the calculation and that those estimates will not be exceeded; that is to say, we may rely that it is not likely to be more than £291,000 at the worst?

Mr. SCUDAMORE. Will you allow me to give you one illustration where I think I have been very moderate. I have only taken off from the expenditure of the companies what they think they could save by amalgamation. I have taken nothing into account whatever, for what the post-office can save by the kind of amalgamation that it will effect.

The CHAIRMAN. How did you get at what the companies think they could save by amalgamation.

Mr. SCUDAMORE. The officers of the companies gave me the information. I will value the single item of accounts. The companies have a present, or had in 1866, six million telegrams, each of those telegrams representing a payment in cash. It will be obvious to any one that the work of keeping the accounts of those 6,000,000 cash transactions, and keeping a check upon them, and seeing that the officers who received the money accounted for it properly, must be a costly one. Taking it at a half-penny every transaction, which I should think was a very moderate amount indeed, it would be £12,000 per annum for accounts and check alone. I will undertake to say, without the slightest fear, that the accounts will not cost us one thousand pounds in addition to what we already spend for accounts. We have from every one of those dots a daily balanced cash account. Those accounts are every day carried into the ledgers of the central office, and we know from day to day what each on their accounts owes to us, or we to them; and when we have got a uniform rate, and have introduced stamps, all that we shall require for the check on the telegraph receipts will be two or three more entries in each of those daily balanced accounts, and two or three more columns in the ledgers at the central office, and £1,000, I am confident, is an extremely liberal estimate for that.

Mr. GOSCHEN. I repeat my question: Do you stand by that estimate and think it a moderate one, and that it will not cost more than £291,000, unless there an increase of business.

Mr. SCUDAMORE. I think not, decidedly.

Mr. GOSCHEN. Are you positive of that? We are taking the matter almost exclusively on you evidence, and I should like to know whether you have a strong opinion upon it.

Mr. SCUDAMORE. I have a very strong opinion.

Mr. GOSCHEN. You have a strong opinion that that amount will not be exceeded, and that you can go up to the number of 11,600,000 messages and carry out your views as regards the increase of business without exceeding £379,000? \*

\* The Committee will observe that Mr. Scudamore estimates the maximum cost of the service when the traffic amounts to 11,600,000 messages at £379,000. This would make the cost of each message precisely 7 pence 3 farthings. Now, by referring to the tables on page 16 and 18 of Report No. 242, ordered by the Senate to be printed April 2, 1874, it will be seen that the expenditures of working the postal telegraphs in Great Britain, exclusive of the amounts charged to capital account, for the year ended March 31, 1873, were £2913,689, and the total number of messages sent during the same time was 15,535,780, making an average cost of over 1 shilling and 2 pence, an increase over Mr. Scudamore's maximum estimate of 6 pence farthing per message, or 81 per cent.

Mr. SCUDAMORE. Yes, you may take it decidedly as my opinion that the more business we get the less in proportion will be our expense.

Mr. GOSCHEN. You allow here for a very large increase; in fact you allow for an increase of 50 per cent of business.

Mr. SCUDAMORE. Yes.

Mr. GOSCHEN. And 30 per cent. increase in cost?

Mr. SCUDAMORE. Thirty-three per cent., I think, I put as the increase in cost for 50 per cent. increase of business, having found that the Electric Company 33 per cent. increase of cost.

Mr. NORWOOD. I want to ask you this: The approximate estimate which you stated at the commencement of to-day's examination as to the total amount of capital required, to enable the government to become possessor of this system, will not in your opinion exceed £6,000,000?

Mr. SCUDAMORE. I think so, decidedly.

Mr. NORWOOD. Is that your deliberate opinion?

Mr. SCUDAMORE. Yes, that is my deliberate opinion.

Mr. NORWOOD. It is formed upon data?

Mr. SCUDAMORE. To a certain extent it is formed upon data; at all events, upon facts which carry conviction to my mind.

Mr. NORWOOD. We take it from you as an important official of the government and a gentleman of considerable reputation, that that is the calculation which you make upon your reputation?

Mr. SCUDAMORE. Yes.

Mr. NORWOOD. You deliberately state that that is your judgment, not hastily formed but deliberately formed, and which you adhere to?

Mr. SCUDAMORE. Yes, I do.

Sir FREDERICK HEYGATE. It may be a good deal less?

Mr. SCUDAMORE. Yes, it may be less; I put that as the outside.

Mr. NORWOOD. We are obliged to take your *ipse dixit* to a certain extent, and I think it a fair question to put you, that the country will look to you if you get possession of the telegraphs to verify your own prophecy?

Mr. SCUDAMORE. Yes, of course; I say that at the risk of my own official character.

There was a gentleman who, under serious responsibility, ventured to act on estimates—a gentleman who had the very best opportunity to form a just opinion of estimates, and who by his representations induced the British Government to purchase the telegraph; and which I will presently show to you has involved an expense of over £9,000,000 in the place of £6,000,000 the highest estimate, with annual losses instead of a national revenue from the business. So the Postmaster-General and Mr Hubbard come here, with estimates obtained at second-hand, a great many of them from the document from which I am reading (the mistaken estimates of Mr. Scudamore), and put them forward as being reliable estimates for this Committee and Congress to act upon. It is for the purpose of giving you the means of knowing how reliable they proved elsewhere that I trouble you with so long a reading from this book. And now I come to the examination of what actually happened in England.

Referring to my statement of the investment in capital account, that is to say, the cost to the English Government for the English telegraphs, I ask your attention to a document attached to the Senate report of this bill. It purports to contain (and I presume it is correct in all matters which it contains against the interests of its author) a statement of the capital account of the English post-office for the telegraph from the beginning of the business to March 31, 1875. A portion of it is estimated, and I have observed that when Mr. Hubbard estimates cost in this business he does not estimate it any higher than is proper. His estimates give the English capital account for the telegraph, 1st March, 1875, at £10,038,000.

The CHAIRMAN. You mean the supposed value of the investment at the time?

Mr. LOWREY. I mean the estimated cost at the

time. The actual expenditures to December 31, 1872, were £8,667,800. Here is an estimate of compensation to railway companies of £788,000 which is yet to be paid. The claims actually made by those railroad companies are understood to amount to over £4,000,000. The English Government has not yet paid for the telegraph. It is just entering on its experience of running a telegraph.

Mr. MARSHALL. Is that an estimate of the value or the cost to the government?

Mr. LOWREY. Of the cost to the government. The figure which I have just named, viz., £10,038,000, is to be compared with the figure of £2,400,000, which was the estimate on which Mr. Scudamore started, and which he assured the Committee of the House of Commons was all that the telegraph would cost the government. And £10,038,000 is what this Senate document informs us that government will have had to pay on March 31, 1875, leaving still unliquidated admitted claims to the amount of £778,000, and asserted claims to the amount of £4,000,000. I understand these claims to be chiefly for rights of way over railroads, in cases where the contract purchased from telegraph companies have expired.

The CHAIRMAN (to Mr. PRESCOTT). Do you know whether the accounts of the Post-Office Department in England are so mingled with the accounts of the telegraph that they cannot be kept entirely distinct, or are they kept distinct?

Mr. PRESCOTT. They are kept distinct. All head postmasters render to the chief offices an account in London, Dublin and Edinburgh, as the case may be—a daily cash account, showing their total receipts and disbursements on postal, money order, savings bank, or telegraph business, and accompanied by schedules giving for each branch of business the details of that business.

The telegraph accounts of all postmasters are sent by them daily to the chief accounting office, accompanied by the forwarded, received and repeated messages and vouchers for money paid out.

(To be Continued.)

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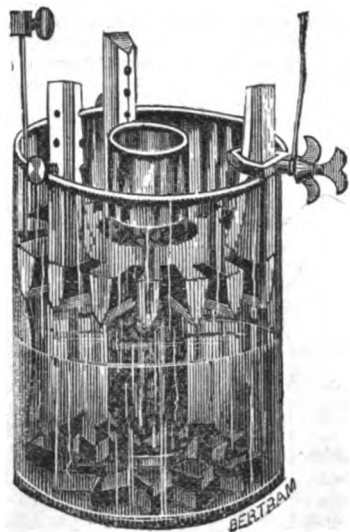
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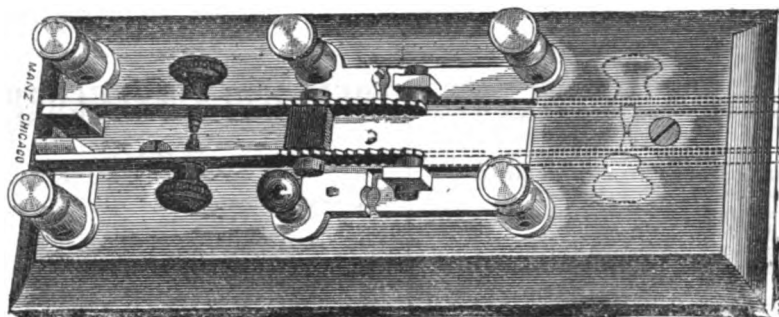
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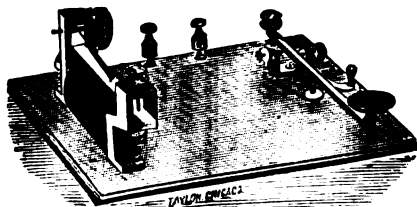
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PATENT APPLIED FOR.

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Price 80 cents each.  
Price per dozen \$3.00.

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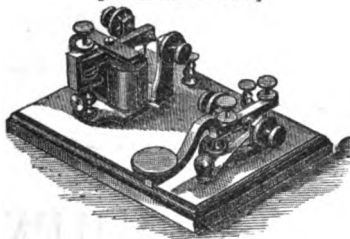
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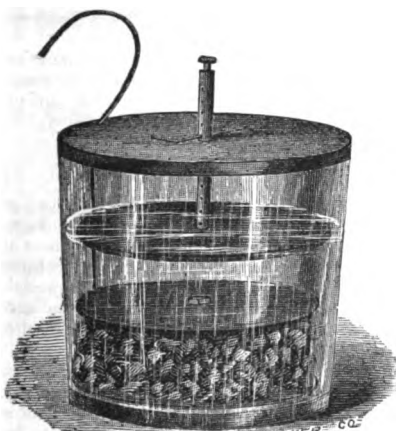
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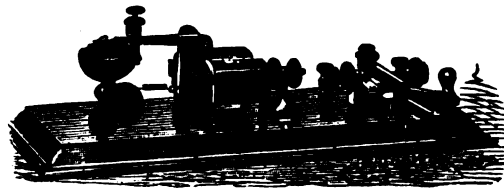
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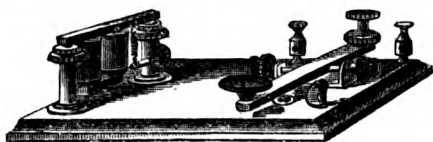
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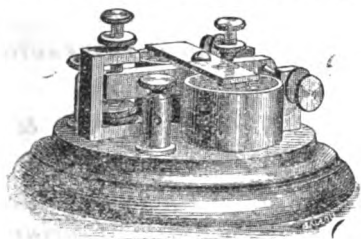
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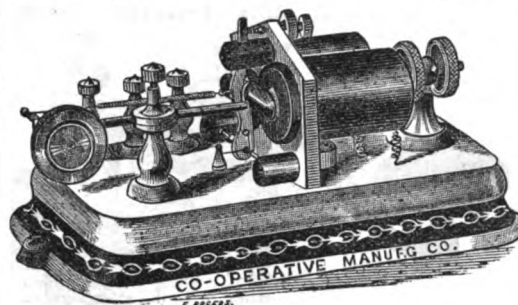
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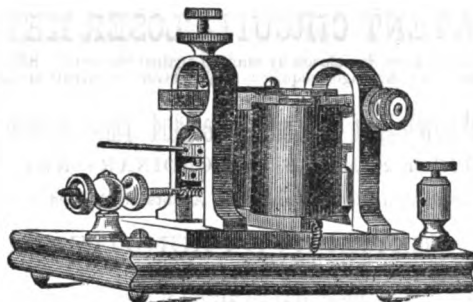
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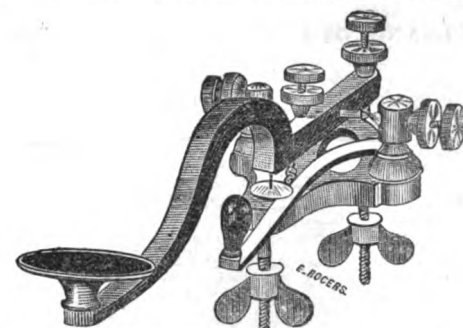
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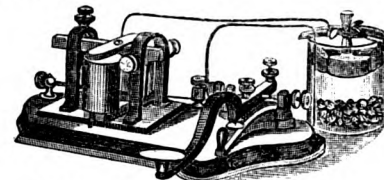
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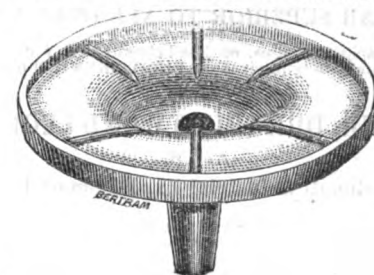
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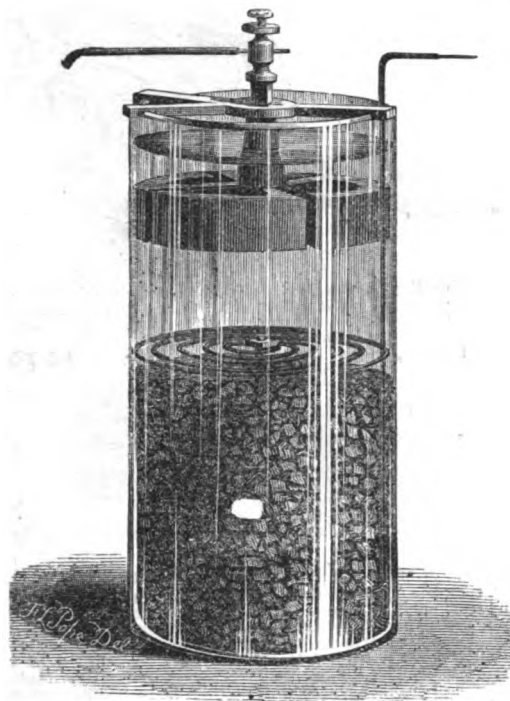
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CLEANLINESS. CONSTANCY. ECONOMY.



THE

## LOCKWOOD BATTERY,

PATENTED APRIL 8, 1873,

L. G. TILLOTSON & CO., Sole Agents,  
No. 8 DEY STREET, N. Y.

This Battery has been in extended practical use for more than a year, and is now acknowledged by leading Electricians in this country and Europe to be

FAR SUPERIOR TO ALL OTHERS

for telegraphic purposes, or closed circuits of any description. This Battery received the FIRST PREMIUM over all competitors for

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The size shown in the cut (No. 3), when charged with 5 lbs. sulphate of copper per cell, is capable of working two or three main circuits of average length for MORE THAN ONE YEAR, without ANY ATTENTION whatever. The copper and zinc solutions are perfectly separated, and there is

NO LOCAL ACTION,

and the circuit is ABSOLUTELY UNIFORM at all times. It is equally well adapted for a

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or for any purpose requiring a uniform, powerful and constant current.

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SOLE AGENTS.

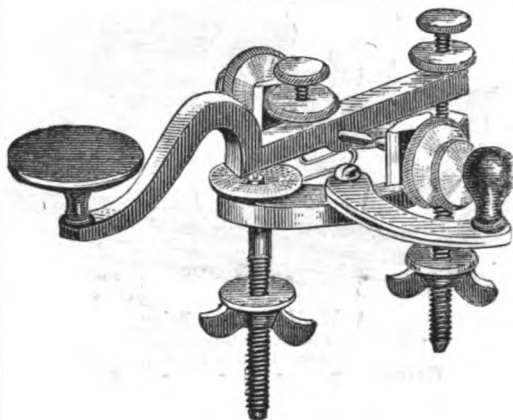
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We have appointed Messrs. L. G. TILLOTSON & Co. Sole Agents for the sale of the Lockwood Battery,

LOCKWOOD BATTERY CO.,  
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## PATENT CIRCUIT-CLOSER KEY,

Does not keep line closed by binding against the anvil. Slight pressure of the finger required to put lever in circuit or cut out.

Acknowledged to be a decided Improvement.  
PRICE SAME AS THE ORDINARY KEY.

Superintendents and Purchasing Agents are invited to examine our

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BEST GALVANIZED WIRE,  
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BROOKS OR GLASS INSULATORS,  
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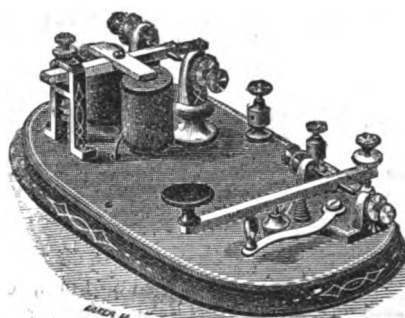
contains some useful information for Superintendents and others interested in the Science of Telegraphy.

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41 Third Avenue,

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## Private Line Instrument



Price, \$10.

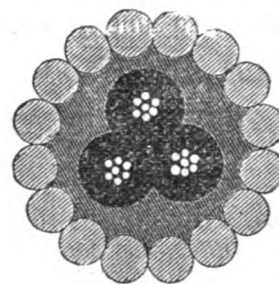
This Instrument is well finished, and gives a clear, loud sound. It is made to work on a line from a few feet to ten miles long. Give length of line in ordering Instruments. One cup of Bliss' Reservoir Battery is furnished with each Instrument.

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TELEGRAPH AND ELECTRIC USE, and for

BLASTING AND MINING PURPOSES,

in every variety desired

As an Insulation for Telegraph Cables and Electric Conductors GUTTA PERCHA has been universally adopted by all scientific and practical Electricians and Manufacturers of Telegraph Cables and Wires in this country and Europe, and has sustained, with increasing confidence in its superiority, the practical test of over twenty years' general use.

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that he will guarantee to make and deliver at his Factory any style of Cable, insulated with Gutta Percha, as low as they can import Cable of the same style and quality.

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Messrs. L. G. TILLOTSON &amp; CO.

8 Dey Street, New York,  
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have been appointed by me GENERAL AGENTS for the sale of any Telegraph Cable or Wire manufactured at the Works in New York, at Factory Prices, delivered in New York.

JOHN THORNLEY, 603 Chestnut St., Philadelphia

has been appointed Agent for the sale of any and all goods manufactured by me, at Factory Prices, delivered in New York. Any goods of my manufacture (except Telegraph Goods), are for sale in New York, by

H. G. NORTON &amp; CO., 28 Park Place

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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 4.

NEW YORK, FEBRUARY 15, 1875.

WHOLE NO. 175.

## THE WESTERN UNION TELEGRAPH BUILDING.

Accompanying this issue of the JOURNAL OF THE TELEGRAPH our readers will receive a very finely executed engraving of the new Western Union Telegraph Building, just completed, corner of Broadway and Dey streets, in the City of New York. The transfer of the wire connections from the old building was accomplished on the evening of February 1, and, as we write, the well-known quarters of the Company for so many years at 145 Broadway already look, like Tara's halls, silent and deserted.

The erection of a building so massive and so magnificent in the very heart of the City of New York, at a cost of over two millions of dollars, to meet the necessities of a business which had its origin less than thirty years ago, is an event in the history of civilization eminently suggestive and remarkable. In 1846, towards the close of the year, a single wire was erected to an obscure office beneath the express offices at No. 16 Wall street. Two wires from Washington terminated in a small room over the ferry house in Jersey City, where three men easily and not very continuously performed all the work required. Now, throughout all our thoroughfares, webbing the air at every corner, the eye is bewildered by the almost countless threads of iron which crowd in from every direction, connecting the whole outlying world with this great central City of New York. The half a dozen men who then performed all the telegraphic work of the city of New York have increased nearly one thousand, there being 610 persons employed in the one building which is the subject of this article. And, instead of a rent of \$500 for a single basement room, the rent of nearly one hundred offices scattered over the city and suburban towns approximates two hundred thousand dollars per annum.

It would be interesting as well as instructive to follow the course of telegraphic development during these intervening twenty-nine years, and the present seems a favorable opportunity to do so. We cannot, however, enter upon it, for it requires much accuracy of detail, and may hereafter form the topic of an elaborate and careful review. It has attained its present growth through the management and enterprise of private skill and labor, which has instinctively based the possibilities of success upon a careful conformity in its administration to public necessities and sentiment. Had this not been faithfully studied, no such result as that which finds one of its expressions in the great structure of which we now propose the description would have been possible. The building itself is a sublime act of confidence in public appreciation. It is a pledge to the nation.

### THE SITE.

The site of the building which now forms the headquarters of the Western Union Telegraph Company

is on the corner of Dey street and Broadway, in close proximity to the new Post-Office, and within easy distance of the offices of the great newspapers whose elegant edifices form so marked a feature of the architecture of this portion of the city. It comprises 8 lots, 25x100 feet on Broadway, purchased of Dr. Evans, and two lots on the rear on Dey Street, 25x78, owned by various parties, the total cost being about \$900,000. The plan of the building finally adopted was submitted with many other competitive designs from other parties by Mr. George B. Post, architect, of New York, into whose hands its construction was committed.

The excavations for the new building were begun in September, 1872, and the foundations were laid during the following Fall and Winter. It is built of brick and granite in what, with some latitude may be designated as the French Renaissance style, the main idea in its construction being to reduce in appearance, by the proportions and the arrangement of the details, the great height of the building as compared with its width or front. The outer wall is 140 feet in height and has 75 feet front. The top of the platform of the roof of the clock-tower is 230 feet above the sidewalk, the center line of the clock being 184 feet from the street level. The top of the vane on the flagstaff is a little higher than Trinity Church spire. A peculiarity in the construction of the interior of the building is that the three upper stories in the roof, with their brick and iron floors, are entirely supported by iron trussed beams, which have a span of 65 feet. There has been no wood used in the building except for the doors, window sashes and their trimmings, and the wainscoting.

The foundation and cellar walls were built by James B. Smith and William Progers, at a cost of \$39,850, and were laid with great care. To the same parties was assigned the mason work of the superstructure, at \$148,000. The masonry of the ground story is of Quincy granite, and the upper stories of granite from Richmond, Va. The brick used came from Baltimore, Md.

The iron roof, embracing three floors, constructed so as to require no support, except from the outer walls, thus leaving the operating room on the seventh floor unobstructed, was erected by J. B. & J. M. Cornell of New York. The same parties constructed the tower, which derives support from four massive iron columns in the east end of the seventh floor. The floors throughout are on 12 tiers of iron beams, arched with brick, and on which is laid what is called the Beton Coignet flooring, an artificial stone  $1\frac{1}{2}$  inches thick, laid by the New York and Long Island Coignet Stone Co. of Brooklyn, between borders of encaustic tile, the whole superficies of which covers about 40,000 square feet. The building is fire-proof throughout.

The main entrance is at the middle of the front on Broadway, and, by an easy and capacious stairway, leads to the first floor. The portico in front is supported by four columns of polished Quincy granite, two on each side. It is in contem-

plation to erect statues of Franklin and Morse on either end of the balustrade which surmounts the portico, although this may be modified by adopting other illustrative designs.

One of the most noticeable points of the architecture is the balcony below the main cornice, which relieves the extreme height of the walls, and gives to the whole structure marked elegance and proportion. The tower which rises high above all other edifices in the neighborhood, 280 feet above the pavement, is now one of the prominent features of this part of the city, ranking with the Trinity and Grace Church spires in the loftiness and elegance of its proportions.

### THE CELLAR FLOOR.

On the cellar floor are six 40-horse power steam tubular boilers with furnaces. Three of these are low pressure for heating purposes, the other three are high pressure for the supply of the machinery. The machinery is as follows:

1. 3 pair Otis Bros. elevator engines—2 of 30 horse and 1 of 20-horse power.
2. Worthington Duplex pump, capable of pumping 1,000 gallons of water per minute to the tanks in the 8th floor, and which supply the water required for wash-bowls, closets and one of the elevators.
3. 2 Knowles' boiler feed steam pumps.
4. 1 horizontal 20-horse power engine for 3 blowers for pneumatic tubes and sidewalk hoisters.

There are 18 wells sunk to a depth of 50 feet, each of which were expected to have a capacity of 60 gallons per minute. Their close proximity to each other, however, reduces their united capacity to about 300 gallons. These wells are all united above ground to a common pipe which leads to the Worthington Duplex pump already named. The wells are known as the "N. W. Green Patent Tubular Wells," and were provided by Marshall Cowing of New York. These wells called, also, "The American Driven Well," all terminate in a water stratum below a hard pan, which excludes all surface water, and the well pipes are driven down by displacing the earth without removing it upwards as done in other boring processes. The water, when reached, rises to within a few feet of the surface, the temperature remaining throughout the year at from 52 to 54 degrees. About 13,000,000 gallons of water are thus produced daily from similar wells throughout the city, especially at breweries and sugar refineries, where purity is desirable.

In this basement there is placed the largest gasometer in New York, being 4 feet long by 54 feet in width. The cellar allows a large space for the heavier goods of the Supply Department.

### SUPPLY DEPARTMENT STORE-ROOM.

The space between the cellar or engine floor, and the ground floor proper, has been utilized by throwing in an extra floor extending along the whole length of the building, for the material of the Supply

Department, and where its goods are assorted, and where all its packing is done. It is connected with the offices of the Supply Department by a stairway at its western extremity, and is provided with side-walk hoisters for receiving and discharging material.

#### THE GROUND FLOOR.

The ground floor is two steps below the level of the pavement on Broadway, and three steps above the level of Dey street, at its rear entrance. To the right of the main entrance on Broadway are the offices of the Treasurer, which consist of two rooms, one his private office, the other for general purposes, both of which are tastefully furnished, and the counters of which, with the glass barricades, are exceedingly neat and appropriate. The vault of the Treasury Department is constructed of massive iron plates, underneath the steps of the front entrance, and accessible from the general office. The office of the Treasurer is thus separated from the traffic of the building, and is accessible from the street, greatly to public convenience.

On the corner of Dey street and Broadway are the entrances to the Receiving, Money Transfer, and Delivery departments, and also to the elevators. The vestibule is spacious, and double doors protect from cold. At the entrance, occupying a space of 80 feet from the front, and enclosed within elegant mahogany counters with glass barriers, and having interior arrangements of great neatness, is the office of the Cashier and the Department of Money Transfer. Between this and the Cable Message Department is a wide hall for access to the three elevators. In a continuous counter of great elegance, broken only by the immense piers which support the walls above, are ranged the Cable, General Message, City and General Delivery Departments. The spaces occupied by the piers are utilized for desks, for the convenience of the public in the preparation of messages. Besides these, desks are provided between all the windows for a like purpose, leaving a space of unobstructed room 19 × 80 for the public use. Four pneumatic tubes, one from the cashier's department and three from the general receiving department, connect with the operating room, and by which messages are transmitted instantaneously thereto. The messages are placed in small, round boxes and dropped into the tubes, which, by an air-exhausting apparatus, are conveyed in 2 seconds into the hands of the distributing clerks in the operating room. The messages from the operating room for delivery are placed in the same boxes and fall to the delivery floor by their own gravity. A speaking tube also connects the receiving and operating departments. The floor is laid with tile in mosaic, and the ceiling of this as well as the offices of the Treasurer is frescoed in the most artistic manner, giving the whole room, in connection with its general furniture, a look of elegance, good taste and comfort. In the rear of the Delivery Department are the messengers rooms with access to the street by the rear door on Dey street.

Occupying the extreme end of the ground floor are the convenient and pleasant offices of the Superintendent of Supplies and Storekeeper. These comprise 8 rooms. 1. The room of the Superintendent in the rear. 2. The Storekeeper. 3. The Bookkeepers. These offices are tastefully and conveniently arranged.

All these apartments are amply lighted with numerous gas fixtures, those in the Treasury Department being of great neatness, and all of them elegant and appropriate.

#### FIRST AND SECOND FLOOR.

The first and second floors are not yet completed. The former, which is the main floor of the building,

with lofty ceilings and which will be finished in a style consistent with its fine and ample proportions, will be occupied by the Phoenix Fire Insurance Company, and the latter will be partly occupied by the Company, and a portion be rented to other parties.

#### THE THIRD FLOOR.

The whole of this floor is occupied by the Executive Officers of the Company, the Electrician, the Electrician's test rooms and Draughtsman, and the JOURNAL OF THE TELEGRAPH. The President's room is on the north-east corner, and is very tastefully and conveniently arranged and furnished. On the corners of the large panel of the ceiling, which is very handsomely frescoed, are the names of Volta, Franklin, Morse and Field. A cabinet of simple yet elegant structure, for the filing of books and papers, occupies the whole length of one side of the room, in the centre of which is the fire-place, over which is erected an elegant mantle bearing a bronze bust of Prof. Morse. The fire-place is provided with a gas imitation wood burning apparatus. Vice-President Mumford, Vice-President Green, Vice President Cornell and the Company's Electrician, Mr. Prescott, occupy the remaining rooms, except the last, which is used as a lunch room for the Executive Officers. The Testing rooms and Draughtsmen's apartment are on the north side, where also, in a room adjoining, is located the editorial room of the JOURNAL OF THE TELEGRAPH.

#### THE FOURTH FLOOR.

The fourth floor is only partially finished. The front rooms, with two additional apartments on Dey street, will be occupied by the Company's Counsel. The Tariff Bureau and Commercial News Department at present occupy the rear rooms, and the offices of the Gold and Stock Telegraph Co. will probably be located on this floor.

#### THE FIFTH FLOOR.

The front rooms on this floor are occupied by Gen. Superintendent Van Horne, Assistant Gen. Superintendent Hinchman, and District Superintendent Brown, with their aids. Capt. Mackintosh, Superintendent of Construction, occupies the room adjoining on Dey street, the whole of the remaining apartments being occupied by the Auditor and his aids. The ladies of the Checking Department occupy the large and pleasant room at the rear, facing on Dey Street.

#### THE BATTERY ROOM.

The Battery room occupies the whole of the sixth floor. The battery used is the Callaud or Gravity battery, and the cells are arranged on frames so as to be easily reached for examination and renewal. The floor can accommodate 70 of these frames, which support each 240 cells, or a capacity of 16,800. There are 7,000 cells now in use, the average weight being about 20 lbs. per cell. A small portion of this room is at present used for enveloping messages as they are dropped from the operating room above. The wires all pass into this room in cables, and are distributed through apertures to the operating tables above, and to the switch-board of that Department in the rear.

On the north and west sides of the building on a level with the battery room, wrought iron tubular fixtures are placed, bearing wooden pins and glass insulators, to which the line wires are brought. The leading in wires enter above the windows, through hard rubber tubes, and are connected directly with lightning arrestors, which extend along the wall near the ceiling. From these arresters gutta percha

coated wires in cables of eight, are led to the switch board in the room above. From the switch a similar cable of 8 wires is conducted to each of the operating tables, through apertures alluded to elsewhere.

In the north-east corner of the sixth floor, is the wardrobe of the operating room, where each operator is provided with a convenient place for garments unneeded while on duty.

#### THE OPERATING ROOM.

This room is the leading feature of the building, and occupies the whole of the seventh floor. It receives light from every side through 42 windows, and, being above the height of all adjacent buildings, commands a most magnificent view of the city and harbor, and of Brooklyn and Jersey City. The height of the ceiling is 23 feet, and the room is unobstructed by columns, except at its eastern end, where four fine pillars, tastefully ornamented, support the massive iron work of the tower above. The air of the room is delightfully pure and healthy. It is warmed by steam from 15 radiators, and the vitiated air is carried off by twenty ventilators, thus securing at all times a healthy atmosphere. The ceiling is very handsomely frescoed with an imitation sky, and monogrammed in the corners with the not very poetic letters, T. O. Room. The coloring is cheerful throughout and the walls plain. The whole impression of the room is one of healthiness and cheerfulness. There are three approaches to the room: one behind the switch board and one at each end, all on the north side. The floor is of artificial stone, called the Beton Coignet flooring, of the color of light sand stone, with a neat border of encaustic tile. Through this floor 87 iron cases, three inches wide by ten in length, lead to the battery room, and through which the wires are led, unseen, to the machinery of the tables which stand over them.

#### THE DIMENSIONS OF THE ROOM

are as follows: Length, 145 feet; width, 70 feet; height, as already stated, 23 feet. The number of persons employed in this department is 290—215 males and 75 females. The entire operating forces, including the ladies' and commercial news department, formerly occupying separate apartments, are now united. The ladies' department occupies the west end of the room, embracing, perhaps, one quarter of the whole floor, and is, for the present, separated by a light partition about 8 feet in height. The commercial news department occupies the north-east corner near the chief entrance, and the cable staff, formerly occupying a separate apartment, now has its machinery in the southeast corner of the general operating room.

#### THE OPERATING TABLES.

There are in all eighty-seven tables, constructed for foursets of machinery on each. These tables are flat and intersected by clear glass partitions of 12 inches in height, enclosed in a light mahogany frame, and which perfectly separate the sound of the instruments from each other. Indeed, it is one of the pleasing peculiarities of this vast room, that although the air is full of sound from the action of so many instruments all in operation at the same time, there are no sharp articulations of the stroke of instruments to distract the ear or weary the brain. This is the result partly of the non-resonant properties of the floor and the height of the ceiling. Even the working of the printing instruments do not interfere with the comparative quiet of the room. The tables are 5 feet 8 inches long, by 8 feet 8 inches wide, the tops of which are of mahogany and the body of cherry.



## THE SWITCH BOARD.

In the center of the room, on its north side, is erected an immense and most tastefully arranged switch board, arranged for the distribution of 300 wires. There are in all seven panels of switches, each 4 feet square, and separated from each other by plates of looking glass about 8 inches wide, with neatly fluted mahogany pillars on either side, and the whole surmounted by an elaborate and tastefully executed cornice. Five of the switch panels occupy the front and two the ends, which stand at right angles, the whole occupying a space of 26 feet in front, with return ends of 5½ feet each, making a total length of 37 feet. A counter of elegant panel work, 4 feet in height, sustains the switch boards, and on which convenient space is given for the machinery necessary for the use of the managers. The switches themselves need no explanation or description. Five of them are arranged for 43 wires, and two for 41 wires each. The metal strips are nickel plated and are exceedingly simple and tasteful. Every part is easily accessible both from the front and rear. It is proposed to place the manager's desk on the top of the switch board so as to command the entire room. It will be a commanding position.

Besides the main switch an elegant 300 wire switch board will be erected for the use of the wires of the Gold and Stock and Commercial News Department, on the north wall adjoining the eastern entrance.

## THE PNEUMATIC TUBES.

Immediately in front of the switch board, and enclosed on all sides within a continuous table, on the outer edge of which are constructed the receptacles for messages for distribution among the operating tables, are the exhaust boxes of the pneumatic tubes connected with the Receiving Department, and into which the boxes, with the messages from that department, are deposited. These boxes as they arrive start a bell, which rings until stopped by the attendant withdrawing the messages. A number of nimble boys distribute these to their appropriate tables, but it is designed to reduce this labor by tubes to various sections of the room, so as to prevent the running to and fro of so many boys, thus securing desirable quietness and greater rapidity in reaching the instruments with messages for transmission as well as in the delivery of messages received.

## DAILY BUSINESS DONE.

The average number of messages daily sent and received in this room is as follows:

Messages sent.....	11,800
Messages received.....	12,200
Number of words, news reports.....	89,000

or the equivalent of 3,000 messages per day; in all a daily transmission of about 27,000 messages per day.

## INSTRUMENTS.

The machinery in use is as follows:

Morse instruments.....	149
Phelps' printing instruments.....	6
Duplex machinery, sets.....	15
Quadruplex machinery, sets.....	7
Milliken's automatic repeaters.....	4
Button repeaters, sets.....	6

The machinery of the operating room represents a capacity of about 200,000 messages per day.

## GAS LIGHTS.

The room is lighted from 181 gas-burners, 56 of which are from seven chandeliers, and 16 from four beautiful four-light burners on the corners of the distributing table. Each operating table has a gas

light, with a neat shade in the center. The gas fixtures throughout are finished in the style known as verdé antique.

## WIRES.

City wires—to hotels, &c.....	48
Outside wires.....	107
Branch office wires.....	8
Private line wires.....	8
Loop wires.....	118

## THE EIGHTH FLOOR.

The eighth floor, on its southern side, is being fitted up for the use of the New York Associated Press, the agent occupying the front center room. The apartments on the north side are occupied by the Bookkeeping Department, the outlook from the windows of which is one of rare extent and beauty. At the rear are the immense tanks of water from which the wash bowls with which every room below the seventh floor is furnished, and for the closets and one of the elevators, which, as stated elsewhere, is worked by a new method of water balances. They also supply large pipes which pass through all the main halls, with faucets in each to connect with hose in case of fire.

## THE NINTH FLOOR.

On the ninth floor there are eight rooms and a large kitchen with an extensive range and cooking apparatus, and also having connected therewith a commodious cupboard and a washing and drying room. Part of these rooms are used by the auditor, for the storage of records, and the rooms in the rear will be occupied by the janitor and his assistants. The remaining rooms are reserved for storing purposes.

## THE TENTH FLOOR.

This is a single room, which may be serviceable for storage, at the end of which an auxiliary tank is placed. At the east end are the approaches to the tower by an iron winding staircase, and at the west end to the roof. Machinery for a system of electric time-keepers throughout the building, including the large clock in the tower, are in progress the completion of which we will duly announce.

## THE ELEVATORS.

There are in all four elevators. Two of these are conveniently arranged in connection with the main halls of the building, commencing on the floor of the Receiving Department and terminating with the fifth story. These are worked by Otis' elevator engines, are lighted by gas chandeliers, are very tastefully finished, and have a capacity for 18 persons each. A third elevator, capable of holding 14 persons, having its landings in connection with an iron staircase which winds up the north wall of the building and terminating also on the fifth floor, is worked by a system of water balances, the water flowing into a cylinder of great size on the rear wall from a reservoir on the eighth floor. This is designed for the special use of the Company's employés. A fourth, of much smaller proportions, is constructed for the elevation of material to the different floors, and extends from the cellar to the upper story.

In addition to the elevators a massive and easy iron stairway leads to the various floors throughout the building.

## RESIGNATION OF SUPT. PLUMMER.

Mr. O. P. S. Plummer, Superintendent in the District in the Pacific Division which extends from Yreka, Cal., to Victoria, V. I., has resigned, and is succeeded by Col. Frank Lamb. The operators attached to the district met in telegraphic convention, and addressed Mr. Plummer in very complimentary terms upon the occasion, to which the retiring Superintendent made a fitting reply.

## RUBBER THERMOMETERS.

M. Kohlrausch having several times noticed that glass flasks, closed by stoppers of hard rubber, burst, concluded that this substance must be very dilatible. This hypothesis was fully verified by experiment, for the expansion of this body was found to be about three times that of zinc. From his measure the coefficient of dilatation for 1° between 16.7° and 25.3° = 0.0000770, and between 25.3° and 35.4° = 0.0000842. Thus, not only has hard rubber a very great coefficient of dilatation, but the latter increases very rapid with the temperature.

This remarkable property can be applied to the construction of very delicate thermometers. Thus, with a small instrument, consisting of two strips of rubber and ivory eight inches long glued together and fastened at one end, we obtain at the other extremity a considerable movement for a change of temperature of one degree. The coefficient of hard rubber is equal at zero to that of mercury; above, it is greater. We can, then, as a curiosity, construct a mercury thermometer with a reservoir of this substance, whose changes will be the opposite of those of a common thermometer; and which will fall with an increase of temperature.

## THE INTERNATIONAL TELEGRAPHIC CONGRESS.

The correspondent of the *Pall Mall Gazette* writes: "In the International Telegraph Congress, which will be held in St. Petersburg this Summer, the Submarine Cable Companies intend to take an active part. They have already prepared a motion that despatches shall be reckoned by the number of letters and not words, because the words are confounded and run together at present in an almost incredible manner, thereby considerably reducing the number, and increasing the work of the telegraphic agent in the same proportion."

**BREGUET'S EXPLODER.**—The exploder devised by M. Breguet has come extensively into use for blasting purposes, firing torpedoes, etc. It is capable of producing an explosion, with suitable priming, at considerable distances. Thus a priming at Toulon has been exploded from Paris, notwithstanding the enormous loss of electricity in the aerial telegraphic wire employed as conductor. An improvement in the apparatus has recently been made by M. Trevé; and he has nearly doubled its power. He has replaced the right armature of the Breguet exploder by an armature of horse-shoe form, the arms of which are "embobbed" like those of the magnet. He finds that the current produced after separation in the bobbins of soft iron is much more powerful than that produced in the bobbins of the magnet; and further, that a still greater intensity may be obtained by uniting the effect of the four bobbins. By such combination he obtained, *e. g.*, a galvanometer deflection of 25 deg., or two and a half times greater than with the original arrangement.

The Society of Telegraph Engineers have acquired with Sir Francis Ronald's library a MS. catalogue compiled by himself, which purports to comprise all the works which have ever been published in any language on the subject of electricity and the cognate sciences, and this catalogue contains nearly 10,000 entries; but only about half of these works (5,000, including pamphlets, &c.), were in the possession of Sir Francis himself. This catalogue will shortly be published by the Society of Telegraph Engineers, and the library itself will be accessible under the necessary regulations to all who may be interested in the science of electricity.

## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

I am in charge of an office. I send a through message to "A." "B" is repeating office. "C" office hears it, and asks me to repeat the message to him which I sent to "B." I refused, believing he had no right to it whatever. "C." grumbles, and says something about not being very accommodat- ing. Am I right? "A."

Answer.—You acted perfectly right.

NAVASOTA, TEXAS, Jan. 17, 1875.

To the Editor of the Journal of the Telegraph:

By answering the following you will much oblige: A. comes into my office—sends a message to B.—Collect; A. guarantees collection; B. pays charges on message when he receives it, and sends one to A.—Collect; A. refuses to pay for answer, or has left town as the case may be; I notify sending office to collect there; he replies, "Can't collect, 'tis an answer." Who is responsible for the tolls?

J. F. BRIGANCE.

Answer.—B. is responsible. The office should not have taken from him an answer to a collect message unless it was prepaid.

To the Editor of the Journal of the Telegraph:

Please inform me through the JOURNAL if mes- sages written in cypher are to be accepted when presented on railroad franks, or, in other words, do railroad franks cover messages written in cypher, the purport of which the receiver cannot possibly understand?

ENQUIRER.

Answer.—When a message of this character is offered under a frank, it would be proper for the receiver to ask for assurance that the frank covers it. The sender's word will be sufficient for the receiver. The frank must be honored in any case; but if there is any doubt as to the right of the mes- sage to pass, it should, after being transmitted, be referred to the Superintendent.

To the Editor of the Journal of the Telegraph:

Please give me information concerning the fol- lowing: A message comes from Brooklyn, 28th, "via New York, 28th"—five words in body of mes- sage—check given, 10 paid; I dispute it, and count it 9—only four extra words. Sending operator in- sists that I count "via New York, 28th" as five words; is this correct? Please answer through JOURNAL.

S. CASE.

Answer.—There are only three extra words in the date as given, making eight in all. Only the actual number of words which are upon the message when tendered, should be charged for.

McCONNELLSBURG, PA., January 26, 1875.

To the Editor of the Journal of the Telegraph:

A man whose name I know writes a message under another signature that I don't know. He re- marks that this party requested him to send the mes- sage. Time reveals message to have been a forgery, and a certain party loses \$500; the forgery of the message being a link in the chain that resulted as stated above.

Please state responsibility of operators, and if they have any right to refuse or suppress messages under such circumstances?

T. F. S.

Answer.—The message could not have been refused. Employees have no right to refuse or suppress any message offered, which conforms to the rules of the Company. The telegraph is nothing but a machine, and its workers a component part thereof. It is not

responsible for the contents of any message trans- mitted, and cannot impute criminal or improper motives to any one requiring its services. Of course, messages couched in obscene or profane language, must be refused under any and all circumstances.

TOWNSEND, DELA., Jan. 29, 1875.

To the Editor of the Journal of the Telegraph:

This is repeating office for Masseys, Md. On the 15th inst. I received telegram for Still Pond, via and mail at Masseys. It appears mail had left Mas- seys before I received the message. Sending office was not notified about message being too late by mail. Was it not the duty of Masseys to notify? And can it be said there was any negligence on my part, if Masseys failed to notify the sending office?

W. S. LEDNAM, Manager.

Answer.—It was neither your duty nor Masseys to send such notification unless the same had been requested in accordance with Rule 13. Such a mes- sage would have been unauthorized and improper, and its transmission would have rendered the office sending it liable for the tolls. No blame can be im- puted to either, if all was done that was possible to catch the mail.

CLEVELAND, Feb. 2d, 1875.

To the Editor of the Journal of the Telegraph:

Is rule No. 4 still in force in regard to counting extra words in date?

In following example, which should be counted?

CHICAGO, Feb. 2, via DETROIT, Feb. 2.

I understand Rule to count Chicago, Feb. 2, as three words. A message of this character passed to destination recently counting four extra words.

ENQUIRER.

Answer.—Rule 4 is in force. Your understanding of the Rule is correct. There are but three extra words in the example.

## FIFTY YEARS' PROGRESS.

(From the London Times.)

Few things in our day have experienced such rapid development as the electric telegraph. It is true that nearly 2,000 years ago the keen-sighted, inquisitive Greeks had set about to inquire into the source of that marvelous power which we call elec- tricity, and it is equally true that this invisible force must have existed a long time prior to the inquiries of these ancient Greeks. But the practical applica- tion of it, as it exists in our day, is a thing of com- paratively recent origin—so recent, indeed, that many of the early disciples of electric telegraphy have lived to witness the realization of all their hopes, and more. As early as the year 1600 the subject of electricity and magnetism began to engage the atten- tion of thinking men in England, and throughout Europe; and to this period belongs the Latin treat- ise of Dr. Gilbert, of Colchester, which may be said to have been the first really practical work on the subject. Then followed the discoveries of Stephen Gray, a pensioner of the Charter house, Du Faye Franklin, Galvani, Volta, Sir Humphry Davy, Ritter of Munich, Oersted, the celebrated Danish philoso- pher, Arago, Sturgeon, and Faraday. These, how- ever, had all labored more or less in the higher field of electrical science; although, as a matter of course their labors tended in no small degree to bring about the consummation which very speedily followed the important discoveries of Faraday about the year 1830. Prior to this—viz., in 1753—one Charles Morrison, described in the *Scots' Magazine*, under the initials "C. M.," his so-called "Expeditious Method of Con- veying Intelligence;" but although his system may be said to have contained the germ of that now in use, it was so costly, and so little "expeditious,"

that it required a separate wire for each letter of the alphabet, and practically a separate apparatus for each wire. Morrison's plan was reproduced some twenty years later—in 1774—by one Le Sage, a Frenchman, who submitted it to Frederick of Prus- sia, as an original method of electric telegraphy. But it soon dropped out of notice, both in this coun- try and abroad; and, as is well known, the first real- ly practical telegraphs belong to the year 1837 when Messrs. Cooke and Wheatstone took out their first patent.

The subsequent history of the electric telegraph need not be dealt with here, except so far as it derives additional interest from the perusal of a somewhat curious work published about fifteen years prior to the inventions of Messrs. Cooke and Wheatstone, which probably attracted little notice at the time, and has long since been forgotten. In 1823—just fifty years ago—Francis Ronalds, of Hammersmith, whose labors in the cause of electric telegraphy were as ardent and persevering as they proved disheartening and unprofitable, published for private circulation a little work entitled "Descriptions of an Electric Telegraph," which it is interesting and instructive to read in the light of what has been achieved in regard to telegraphic communication during the past half- century. Mr. Ronalds appears to have been the first to make the experiment, on any great scale, of send- ing a current of electricity through an aerial wire, which he erected on a "lawn or grass plot" near his residence at Hammersmith. Of course it was impos- sible to erect any great length of single continuous wire in such a situation, but Mr. Ronalds very ingen- uously surmounted this difficulty by erecting two wooden frames, placed at a distance of twenty yards from each other, each frame being traversed by nine- teen horizontal bars, and each bar having thirty-sev- en hooks, from which depended silken cords, sup- porting and also insulating a small iron wire. This wire, which made its inflections at the points of sup- port, composed in one continuous length a distance of rather more than eight miles; and when it was charged from a Leyden jar, and the shock passed through two insulated inflammable air pistols, the result was, in Mr. Ronalds' own expressive way of describing it, that "three of the senses—viz., sight, feeling and hearing—seemed to receive absolute con- viction of the instantaneous transmission of electric signs." We need not follow Mr. Ronalds through his detailed account of the experiment; but the im- pression which it seems to have made on his mind, although recorded in somewhat crude and homely language, is remarkable as foreshadowing very close- ly indeed what has come to pass since then. He says: "The result seemed to be that that most ex- traordinary fluid, or agency, electricity, may actually be employed for a more practically useful purpose than the gratification of the philosopher's inquisitive, research, the schoolboy's idle amusement, or the phy- sician's tool; that it may be compelled to travel as many hundred miles beneath our feet as the subter- ranean ghost which nightly haunts our metropolis our provincial towns, and even our high roads; and that in such an enlightened country and obscure cli- mate as this its travels would be productive of, at the least, as much public and private benefit."—"Why," he asks, "has no serious trial yet been made of the qualifications of so diligent a courier? And if he should be proved competent to the task, why should not our kings hold councils at Brighton with their ministers in London? Why should not our Government govern at Portsmouth almost as prompt- ly as in Downing Street? Why should our default- ers escape by default of our foggy climate? and since our piteous *innamorati* are not all Alpheï, why

should they add to the torments of absence those dilatory tormentors, pens, ink, paper, and posts? Let us have electrical *conversazione* offices, communicating with each other all over the kingdom, if we can." It would hardly be possible at the present day to describe more accurately the progress of electric telegraphy than in these characteristic sentences of Mr. Ronalds. We have "electrical *conversazione* offices" all over the kingdom. The wires which practically connect Balmoral, Windsor, and Osborne with Downing Street, enable Her Majesty to "hold councils with her Ministers in London" at any moment; and the extensive system of Admiralty and War Office telegraphs enables the Government to "govern at Portsmouth" (and many places besides) "as promptly as in Downing Street." One of the very first acts of the very earliest telegraph was the capture of Tawell, the Quaker murderer; and the curious ramification of police telegraphy in London, if not an absolute protection against our "foggy climate," is at least a terror to those who might otherwise elude the grasp of the law. As for our "piteous *innamorati*," it is perfectly well known that they use the wires as freely as most people, and that "love telegrams" are gradually taking the place of "love letters."

But, besides foreshadowing many of the uses of the telegraph, Mr. Ronalds has placed on record in his homely treatise many practical suggestions as to its construction and maintenance which are actually being followed—unconsciously, perhaps, for his is no text book of the Science—at the present day. His back garden at Hammersmith appears to have been the scene not only of one of the earliest aerial telegraphs, but also of the first experiment with an underground line. He tells us that "a trench was dug in the garden 535 feet in length, and four feet deep. In this was laid a trough of wood, two inches square, well lined inside and out with pitch; and within this trough thick glass tubes were placed, through which the wire ran. The trough was then covered with pieces of wood, screwed upon it while the pitch was hot; they also, in turn, were well covered with pitch, and the earth then thrown into the trench again." Mr. Ronalds goes on to describe his method of signaling through this experimentally perfect line; and also gives the outlines of a "telegraphic dictionary," by means of which a word, or even a whole sentence, could be conveyed by only three discharges of the wire in a mean space of 54 seconds. Even at such an early stage of telegraphic development, Mr. Ronalds was by no means insensible to the *sine qua non* of a perfect telegraphic system; for he gives it as his opinion that a signal might be transmitted through a buried wire from Carlton House to the Pavilion at Brighton in one minute; and he adds—"Were the time occupied five minutes, I should count this objection rather serious, but "not insurmountable." As a matter of fact telegraphic signals can be transmitted over a continuous wire in an almost imperceptible space of time, the time occupied in transmitting a message being regulated by the number of signals to be transmitted. But Mr. Ronalds' idea of speedy communication was rather in advance of the requirements of his age, and of the means placed at his disposal. His underground telegraph was, however, a very fair specimen of what exists in the present day. We use iron or earthenware pipes in lieu of his wooden trough; but we are not very far in advance here, for he points out in his book, by way of anticipating possible objections to his plan, that cast-iron troughs might be rendered as "tight as gas-pipes," should it be found desirable to employ them. The "thick glass tubes" through which he led his conducting wire have been replaced

by that useful substance, gutta percha, which had not been discovered in Mr. Ronalds' day, but which is now used most extensively as an insulating substance in all operations connected with telegraphy. Not only in the method of constructing, but of testing and keeping in repair our underground telegraphs, have we very closely followed out Mr. Ronalds' ideas. Dealing with the subject generally, he says—"The liability of the subterranean part of the apparatus to be injured by an enemy, or by mischievously disposed persons, has been vehemently objected. If an enemy had occupation of all the roads which covered the wires, he could undoubtedly disconnect my electric signs without difficulty; but would those now in use (the old semaphore, presumably) escape? And this case relates only to invasions and civil wars; therefore, let us have 'smokers' enough to prevent invasions, and kings that love their subjects enough to prevent civil wars. To protect the apparatus from mischievously disposed persons, let the tubes be buried 6 feet below the surface of the middle of high roads, and let each tube take a different route to arrive at the same place." Of course, the danger which Mr. Ronalds here suggests has never menaced our lines of underground telegraph. But his notion of alternative routes is precisely what is done in the Postal system as regards overhead wires; the object being, of course, to divide the risk of having the whole communications with certain places devastated by storms like those which have recently played such havoc with the wires. "Could any number of rogues, then," continues Mr. Ronalds in his characteristic style, "open trenches 6 feet deep, in two or more different public high roads or streets, and get through two or more strong cast-iron troughs, in a less space of time than 40 minutes? For we shall presently see that they would be detected before the expiration of that time. If they could, render their difficulties greater by cutting the trench deeper; and should they still succeed in breaking the communication by these means, hang them if you can catch them, d—n them if you cannot, and mend it immediately in both cases." Mr. Ronalds must have rejoiced at having lived to see a time when cutting the telegraph wires, or otherwise wilfully interrupting the communication, was punishable as a felony; but he proposed to rely on other means than Lynch Law in maintaining his system, and here, again, the telegraph engineers of the present day have followed out his ideas almost to the letter. He proposed to keep his wire constantly charged with electricity,—in other words, to work it on the "permanent current principle;" then to have certain "proving stations," as he calls them, at frequent intervals along the line; and a staff of persons who would constantly watch the "provers," and set out the moment that any indication was given that the line was interrupted. Suitable situations for such proving stations he conceived to be "post-offices in towns and villages, turnpike gates and the like." Then he continues: "We will imagine twenty proving stations established between London and Brighton, or any distance of 50 miles, only four persons employed (but not exclusively, to keep watch over them, and each watchman to have the charge of five provers. It is evident that (were he to dwell at the centre one of the five) in order to examine the two on each side of it, he would have to ride only 4½ miles, which journey he could easily perform in something less than forty minutes, and he would discover that the defect rested somewhere between two of the provers, a distance of 2½ miles. Any sorry little two-penny post cove might take a canter on his Rozinantuolo, and, on his arrival at a prover, perform the operation on it in less time than I have

employed to describe the manner of its performance." Now, what are these innumerable "flush boxes" which are to be found everywhere in the streets of London, and other large cities, but "provers" of our underground telegraphic system? Most people are familiar with the snake-like coils of apparently dirty rope, but really telegraph wires, which are every now and then laid bare in those curious apertures in the pavement, and the little clock-face, with only a single handle, which is the invariable companion of the workman engaged in the hole. He is simply "proving" a wire which has been found faulty, or, it may be, trying to detect one which has shown too great a liking for its next-door neighbor. Then, again, as regards over-head wires, what are the "linemen" stationed at certain intervals along the route of a trunk line but the "provers" of the section which it is their duty to traverse from time to time, working on either side of their station, precisely as Mr. Ronalds would have worked his "sorry little two-penny post cove?" But besides this, there are certain post-offices along the line which are called "testing stations;" and here every morning the wires are disconnected, with the view of testing their goodness, or the reverse. When a "fault" occurs, it is thus easy to "localize" it between two stations; and hence the rapidity with which communication is now restored after a breakdown, as compared with the time long after Mr. Ronalds' treatise was composed.

Mr. Ronalds was, perhaps, as little vain of his achievements in the telegraphic field as the most modest inventor could have been; but many of his prophecies have been fulfilled to the letter. He suffered much at the hands of those who should have been his best friends, as also did other inventors in the same field,—notably, Mr. Alexander, a Scottish electrician, who could not hear the name of "telegraph" without a shudder. Speaking of his treatment by the Government of that day, Mr. Ronalds says:—"Lord Melville was obliging enough, in reply to my application to him, to request Mr. Hay to see me on the subject of my discovery; but before the nature of it had been yet known, except to the late Lord Henniker, Dr. Rees, Mr. Brande, and a few friends, I received an intimation from Mr. Barrow to the effect that telegraphs of any kind were then wholly unnecessary, and that no other than the one then in use (the old semaphore) would be adopted. I felt very little disappointment, and not a shadow of resentment, on the occasion, because every one knows that telegraphs have long been great bores at the Admiralty. Should they again become necessary, however, perhaps electricity and electricians may be indulged by his Lordship and Mr. Barrow with an opportunity of proving what they are capable of in this way. I claim no indulgence for mere chimeras and chimera framers, and I hope to escape the fate of being ranked in that unenviable class."

Unquestionably, Mr. Ronalds was no "chimera framer." He early devoted himself to the study of a system of communication which has distanced all competitors, whether for Imperial, commercial, or social purposes. He lived to be Sir Francis Ronalds, and to bequeath a valuable collection of electrical works to those who have succeeded him in his labors; and we have seen by the perusal of his simple, yet clear and forcible treatise, describing "An Electric Telegraph," how much and yet how little we have learnt during "Fifty Years' Progress."

A telegraph company has been organized at Peoria, Ill., under the name of the Illinois Valley Telegraph Company. It proposes to put up lines to Chicago and prominent points in Indiana and Missouri.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
195 Broadway, New York, February 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Jacksonville, Ala., closed.  
Stonewall, Ala., closed.  
Arkadelphia, Ark., is now a W. U. office, square 481, check direct.

Hereafter the "tariff for other lines" from Laconner, W. T., to offices in B. C. will be as follows:

Barkerville, B. C.	150	+75	Lytton,	100	+25
Burrard Inlet, "	100	+25	Matsqui,	75	+25
Cache Creek, "	125	+50	New Westminster,	75	+25
Clinton, "	125	+50	Quesnelle,	150	+75
Chilliwack, "	75	+25	Soda Creek,	150	+75

Berzalia, Ga., closed.  
Calro, Ga., closed.  
Osman, Ill., closed.  
La Crosse, Ind., closed.  
Chestertown, Md., reopened as W. U. office, square 67, check direct.

Hereafter the "tariff for other lines" to Calumet and Champion, Mich., will be 305 and 15, and 150 and 10 respectively, from Chicago, Ill.

Messages for Port Norris, N. J., are delivered by train leaving Bridgeton, twice daily. Charges for delivery 25 cents.

Hereafter the "tariff for other lines" to Schoharie C. H., N. Y., via Albany, will be 55 and 4.

Offices having a special rate to New York City should use such special rate on messages to and from Harlem, Manhattanville and Yorkville.

Milton Centre, O., closed.  
Morristown, O., reopened.  
Kilbride, Ont., reopened.  
Foy's, Ont., closed.  
No. Winchester, Ont., closed.  
Tarr Farm, Pa., closed, (second notice.)  
Brentwood, Tenn., closed.  
Englewood, Texas, closed.  
Keyser, W. Va., closed.

## NEW OFFICES.

Bridge Creek, B. C., 125 +50 Laconner, W. T.  
Cheam, " 75 +25 " "  
Spence's Bridge, B. C., 100 +25 " "  
Van Winkle, " 150 +75 " "  
Goose River, Pac., 175 12 307 Chicago, Ill.  
196 Harlem, Ga.  
336 Annawan, Ill.  
373 Chase, Ill.  
399 Georgetown, Ill.  
Oregon, Ill., 25 2 307 Aurora.  
281 Brightwood, Ind.  
Alluez Mine, Mich., 215 16 307 Chicago, Ill.  
188 Chippewa, Mich. (There are now offices at both Chippewa and Lake, Mich.)  
Copper Falls, Mich., 245 19 307 Chicago, Ill.  
Eagle Harbor, " 245 19 307 "  
Ontonagon, " 275 22 307 "  
Preston, Minn., 140 9 307 "  
Bennett, Neb., 35 2 474 Nebraska City.  
Palmyra, " 35 2 474 "  
Seward, " 55 4 474 "  
Syracuse, " 35 2 474 "  
41 Stitts, N. J.  
120 Eden Centre, N. Y.  
120 Gowanda, "  
120 North Collins, "  
Centralia, Ont.  
Hullsville, "  
Henfryn, "  
Hillier, "  
Ireland, "  
Ripley, "  
121 Leeburg, Pa.  
Cookshire, Que.  
Robinson, "  
St. Hyacinthe Town, Que.  
Capleton, Que.,

\* Broadway, Va., } 25 2 123 Staunton.  
                          } 50 8 77 Alexandria.  
\* Fort Howard, Wis., 60 4 307 Chicago, Ill.  
\* Wilson, Wis., 100 7 307 "

† For each additional 5 or fraction of 5 words.

## ATLANTIC CABLE BUSINESS.

We are notified that the cable between England and Guernsey (Channel Islands) is now repaired.  
The cable between Pernambuco and Para (South America), is interrupted.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
New York, February 13th, 1875.

The Complimentary Franks issued by this Company during the year 1874, and now in force, are hereby extended until the first day of April.

GEO. H. MUMFORD,  
Vice Pres't.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, Feb. 13, 1875.

On and after March 1st, Thayer, Kas., and Weston, Mo., will be discontinued as money-order offices.

GEO. H. MUMFORD, Vice-Pres't.

EXECUTIVE OFFICE,  
New York, Feb. 8, 1875.

To all Transfer Agents:

On and after February 15th, all money-order offices in L. C. Baker's district will be transferred to R. C. Clowry's district.

GEO. H. MUMFORD, Vice Pres.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENTS 72 AND 73, ISSUED FEB. 20, 1875

Death of E. S. Springsteen and John Stalcup.

E. S. SPRINGSTEEN, of New York City, (Certificate No. 1871, issued January 23, 1872), died at Greeley, Col., January 20, 1875, of Consumption.

JOHN STALCUP, of Washington, D. C., (Certificate No. 930, issued Aug. 12, 1870,) died at Washington, February 6, 1875, of consumption.

Two dollars are due on above assessments from members whose certificates are numbered not above 2374; one dollar from those holding certificates between 2374 and 2387.

RECEIPT OF ASSESSMENTS—NEW YORK, FEB. 11, 1875.

## ASSESSMENT No. 71.

27, 179, 232, 237, 238, 242, 246, 258, 451, 453, 455, 457, 476, 478, 482, 509, 516, 804, 912, 922, 1153, 1217, 1273, 1450, 1531, 1562, 1579, 1619, 1632, 1715, 1716, 1731, 1736, 1798, 1799, 1915, 1922, 1926, 1941, 1974, 1975, 1976, 2015, 2037, 2081, 2083, 2141, 2177, 2190, 2237, 2248, 2263, 2269, 2272, 2275, 2276, 2320, 2330.

## ASSESSMENT No. 70.

1294, 2281, 2282, 2283.

## ASSESSMENT No. 69.

125, 126, 127, 695, 697, 705, 1071, 1400, 1504, 1531, 1612, 1670, 1741, 2151.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

THE following order in relation to the management of the Operating Department of the General Office in New York, has been issued through Superintendent Brown:

1. Mr. A. S. Downer is hereby appointed Assistant Manager of the Operating Department.

2. Mr. Downer will have general charge of the entire operating room floor as well as of the sixth floor immediately below.

3. The Operating Department will be divided into six divisions as follows:

1. The Eastern Circuits in charge of D. R. Downer, chief operator.

2. The Northern Circuits, J. H. Dwight, chief operator.

3. The Southern Circuits in charge of S. H. Edwards, chief.

4. The Western Circuits, hitherto known as the Erie and Pittsburgh, S. S. Bogart, chief.

5. The Cable Circuits, E. A. Leslie, chief.

6. The City Lines in charge of Miss L. H. Snow.  
These divisions will all report direct to the Assistant Manager.

GEO. H. MUMFORD,  
Vice-Pres't & Gen'l Supt.

The headquarters of Mr. George H. Grace, General Superintendent of the Southern and Atlantic Telegraph Company, have been removed from Macon, Georgia, to New York City. Mr. J. G. Thornton has been appointed Assistant Superintendent of the Company, with headquarters at Macon.

Mr. JOHN B. OLTMAN has been appointed receiver of cable messages at the General Office of the Western Union Company in this city, in place of Mr. O. D. Hoyt, who has resigned to go into another business.

## OBITUARY.

HARRISON GRAY DYAR.

Died, at Rhinebeck, N. Y., January 31st, 1875, Mr. Harrison Gray Dyar, in the 69th year of his age.

Residing in Europe from 1831 to 1853, and, since that year, in retirement in this country, Mr. Dyar was comparatively unknown to the present generation, but in 1826-27 he became widely known by his experiments in the then mysterious and unknown paths which afterwards developed the electric telegraph. In 1828 he erected a line of iron wire on wooden posts with glass insulators, at the old Union Race Course, on Long Island, which he worked successfully with static electricity (the constant battery not having at that time been discovered), the currents transmitted discolored litmus paper, which was placed in the circuit upon a moving disc or table. We have no record of the length of this line, but the results obtained were deemed so satisfactory that it was determined to build a line from New York to Philadelphia. This project was, however, abandoned, owing to disagreements which arose between his associates and himself. In the light which we have at this day, we know such a system of telegraph to be impracticable. In fact, no success was practically possible until 1837, when the constant battery was discovered by Prof. Daniell. Mr. Dyar had amassed an ample fortune from his scientific pursuits in Europe, which was largely augmented by real estate investments in the City of New York. Personally he was a gentleman of refined and studious tastes. He was born at Boston, Mass., in 1805.

## THE TELEGRAPH IN CENTRAL AND SOUTH AMERICA.

(SPECIAL CORRESPONDENCE OF THE JOURNAL.)

COLON, Feb. 1st, 1875.

The contract recently made between the National Government of Colombia and Nicolas Pereira Gamba, for a line of telegraph from La Mesa to Neiva, has been modified so as to limit the line to Espinal, with stations at Guamo, Tocaimo and Jirardot or Espinal. The price paid the contractor is \$1,300 per miriometer, or, say, 80 poles.

In Guatemala the telegraph has been extended to the City of Quezaltenango, which puts the Capital in communication with the commercial and agricultural center of the departments of the Altos, one of the finest sections of the Republic. From Quezaltenango, lines are constructed to San Marcos and to the port of Champerico.

In Peru the telegraph question continues to be debated in the House. A number of members are opposed to the management of the lines passing into the hands of the Government, but the great success (according to the *South Pacific Times*) which has attended the telegraph as Government property in other countries, will undoubtedly induce the majority to agree with the views of the Executive.

Advices from Bogota state that Mr. Stokes, a representative of an English Submarine Telegraph Company, is now at the Capital to obtain a concession to lay a cable along the west coast of Colombia.

THE Directory of the Peruvian International Exhibition of 1875 offer a premium of from \$200 to \$500 for the best telegraphic apparatus for fixing upon a railway line the relative situation of trains in motion on the same track, so that conductors may know the minimum distance between them when running.

THE telegraph in the State of Guatemala, Central America, is now completed from the capital to Quezaltenango, the largest city in the North of the Republic, and will soon be extended thence to the port of Champerico, on the Pacific.

AN additional wire between Madrid and Santander, which the traffic from England had rendered necessary, has just been completed by the Spanish Government. Communications with Madrid and the interior of Spain, *via* Santander, will be much accelerated thereby. Telegraphic communication with Bilbao, which has been suspended since August, 1873, is also now re-established by the opening of a coast cable between that town and Santander.

THE traffic receipts of the Western and Brazilian Telegraph Company, from the 20th November to the 25th December, 1874 (five weeks), were £12,764 17s. 4d.

THE Directors of the German Union Telegraph Company have decided to pay an *interim* dividend of 11s. 9d. per £15 bond.

THE Western and Brazilian Telegraph Company have announced an *interim* dividend of 5s. per share for the quarter ending December 31, 1874.

THE receipts of the Submarine Telegraph Company for the month of December, 1874, amount to £7,895, against £7,938 for the corresponding month of 1873.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom for the week ended January 9, 1875, was 342,877—an increase on the corresponding week last year of 20,181.

THE Central American Telegraph Company have received confirmation of telegraphic advices to the effect that the shore end of their cable has been successfully laid at Demerara by the screw steamer *Norseman*, and that the tests were most satisfactory. The authorities at George Town rendered every assistance, as also Her Majesty's ship *Druid*, which accompanied the expedition.

THE West India and Panama Telegraph Company have issued a circular announcing that the dispute between the company and the India Rubber, Gutta Percha and Telegraph Works Company had been settled, and the terms are embodied in the following clauses: "The Colon-Jamaica cable, with its offices, instruments, etc., is to be handed over to this company. The £100,000 in cash and shares now unpaid, and forming the balance of the original contract sum, is not to be paid. The contractors' claims in respect to the St. Kitts Deviation, the Demerara Extension, repairs, extra cable and other matters, amounting altogether to £73,572, are released. The contractors cancel and hand over £9,600 of this company's debentures now held by them. This company releases the defendants from all other claims, and all claims of the defendants against this company are released. The defendants are to give their assistance in procuring the transfers of concessions and subsidies not yet secured to this company, and settle with the parties to whom those concessions, &c., were originally granted." The contractors have also agreed, it is stated, to supply the company with fifty miles of new cable for repairs on very favorable terms. All further legal proceedings in the suit are now stayed.

THE report of the Eastern Telegraph Company for the six months ended 30th September, 1874, has been issued. The revenue for that period amounted to £176,806. The sum is appropriated as follows: £46,323 for the ordinary expenses; £30,222 for special expenditure during the half year; £828 for income tax, and £98,425 for two interim dividends of 1½ per cent. each, and interest on debentures, leaving £1,007 to be carried forward.

## SOCIETY OF TELEGRAPH ENGINEERS.

The fourth session of this society was inaugurated on Wednesday night at the rooms of the Institution of Civil Engineers, Great George street, Westminster. Mr. Latimer Clarke, the president of the year, occupied the chair, and delivered an interesting address on the early history and subsequent development of the electric telegraph. At the outset he alluded to several striking features connected with the invention of the telegraph, many of which were embraced in a recent article in the *Times*, entitled "Fifty Years' Progress." He spoke of Sir Francis Ronalds as having lived some thirty years before his age, otherwise he might have had to be written the inventor of the electric telegraph. After carefully tracing the progress of telegraphy during the past thirty or forty years, Mr. Clarke went on to speak of the great development the system had undergone since it was transferred to the Post-office in 1870. It is estimated that in the days of the telegraph companies the total number of messages in a year did not exceed 6,000,000. But Mr. Clarke showed how in 1871 the number had been increased to 11,000,000, in 1872 to nearly 15,000,000, in 1873 to upwards of 17,000,000, and last year to 19,100,000. The number of miles of wire possessed by the Post-office at the present time was stated to be upwards of 100,000, in addition to nearly 1,500 miles of subma-

rine cables. The number of postal telegraph offices opened at the present time is 5,572, and the number of instruments worked by the Post-office exceeds 9,200. Mr. Clarke pointed out that the Government, instead of retarding the progress of inventions, as was at one time feared, had done everything in its power to foster them, and was always prepared to receive practical suggestions from whatever quarter they might be offered. Adverting to the history of the society, if a society can be said to have a history which has only been three years in existence, the president announced the gratifying fact that the members at the present time exceed 650, and that the annual revenue is nearly £1,000. This result is all the more wonderful when taken in connection with the fact that the parent society, the Civil Engineers, was thirty years in existence before it possessed so large a membership. The society possesses a journal in which its proceedings are printed, and Mr. Clarke did not despair of the time when it would possess a laboratory and a system of experimental lines for the benefit of students, many of whom are members of the society. Their example, too, had been followed in America, where an Electrical Society had been formed in Chicago with every prospect of success. But perhaps the most interesting feature of the evening's proceedings was the announcement that the magnificent library of electrical works collected by the late Sir Francis Roland had been transferred in trust to the society, with reversion to the Royal Society in the event of the dissolution of the Society of Telegraph Engineers. This library, which is said to contain nearly 10,000 volumes, was bequeathed to Samuel Clarke, brother-in-law of Sir Francis Ronalds, who was present at the meeting and elected an honorary member of the society. Mr. Clarke concluded by pointing out that the progress of telegraphy, whereby messages could be sent at a greater speed than formerly must ultimately lead to the cheapening of the rates, and suggested a special and higher rate for "express" messages, just as we have express trains at higher fares. This is a subject which has often engaged public attention, but it may fairly be doubted whether, with the national system of telegraphy which we now possess, any such system of special telegrams could be worked with advantage to the numerous interests concerned. A vote of thanks to Mr. Clarke for his admirable address was proposed by Mr. Hooper, the well-known cable manufacturer, and seconded by Professor Hughes, the well-known electrician and inventor of the admirable instrument which bears his name.

THE German Federal Council has resolved to invite the Chancellery to cause a report to be drawn up by experts having especial regard to the following points:—1. Whether in all cases of extension the municipalities of the places benefited may not be fairly called on to contribute, a scale being prepared from existing data to show the cost of erecting and working new stations at small towns, and the losses suffered on their account by the central administration. 2. Whether the railroad companies are now contributing a fair share of the benefits they enjoy, and whether new agreements ought not to be entered into with them which shall be more equitable to the public. 3. And finally, whether the administration as now worked by districts is not a needlessly costly organization in itself, and one admitting many minor economies, especially by the employment of female labor in the offices.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

### TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

193 Broadway, New York.

NEW YORK, FEBRUARY 15, 1875.

THE Executive Committee of the Western Union Company have authorized the President, at his discretion, to reduce the rates between certain points reached by competing companies. A reduction has accordingly been made between Boston, Washington, Albany and New York, and intermediate stations, which takes effect to-day.

AN Executive Order, continuing the force of the Complimentary Franks, issued during 1874, until April 1st, 1875, will be found on page 54.

WE are requested to call attention to the fact that there are two places in Illinois bearing the name of Mounds, one in Pulaski and the other in Brown County. There is a telegraph office at each place. It frequently happens that messages for Mounds reach repeating offices without the county being stated, and this causes confusion and most always delay. Managers will please be careful to make the address definite in this and all analogous cases.

These troubles would not occur if a change was made in the name of one of the offices. We suggest this to the General Superintendent.

CITIZENS of California are memorializing the Government to authorize the extension of telegraph lines from the Northern Pacific telegraph lines to the lighthouses and life-saving stations on the coast of California, and make an appropriation therefor.

THE Senate Committee on Post-Offices and Post Roads have been considering the bill introduced by Senator Dorsey, which proposes to regulate the transmission of commercial and other intelligence by telegraph, and make all telegraph lines post routes. No conclusion has been reached.

### FIFTY YEARS AGO.

The death of Harrison Gray Dyar, which recently occurred at his residence at Rhinebeck, N. Y., recalls once more the days in which the infant telegraph was struggling for birth in the womb of time. Mr. Dyar was to America what Sir Francis Ronald was to England, a man whose conception of the possible was in advance of the world around him.

It seems almost incredible in these days, when the telegraph is a power in the land, solid in its foundation, and grasping in its spread, that, less than fifty years ago, a man whose brilliant genius conceived of its possibility, and who endeavored to demonstrate its practicability, should have fled to a hiding place, to remain many months, to avoid prosecution at law for inventing and operating an electric telegraph. And yet such was the fact. A former agent, disappointed in obtaining a concession of a share of the project, actually obtained a writ against Mr. Dyar under a charge of conspiracy for carrying on secret communication from city to city.

How supremely ridiculous this sounds now, and perhaps it would have resulted so then, but lawsuits, even with a certainty of favorable result, are formidable affairs to pursuers of science, whose acquirements of brain are usually in proportion to their lightness of pocket. It is likely, too, that a remembrance of the fate of Galileo cautioned discretion.

Mr. Dyar has passed away. We believe that with the exception of Prof. Henry and Sir Charles Wheatstone, he was the last link connecting the past with the present of the telegraph. It cannot be long ere they will depart also. When that time arrives, the first age of the electric telegraph will have been completed.

### THE TELEGRAPHERS' BALL.

The first annual invitation ball of the New York Telegraphers' Association was held in this city on the evening of February 4th, at Ferrero's Assembly Rooms, Tammany Hall. At the back of the platform on which the band was stationed was a picture of the new building of the Western Union Telegraph Company at Broadway and Dey street, and above this was placed an electric gong. On the platform were a battery, sounder, relay and key, by which the names of the dances were called, the gong first giving notice. The room was perfumed during the whole evening by means of three atomizers, which ejected streams of perfumed vapor. At 10:30 P. M. the gong was sounded, and the telegraph instruments gave the order to "clear the floor." The band then performed the "Grand Entree," by Bernstein, during the promenade, in which a number of handsomely dressed ladies participated. Many prominent telegraphers of this and other cities were present. The ladies' order of dancing represented the Morse key and sounder, and was very elegantly illustrated, while the gentlemen's order represented an insulator. The floor was under the management of Mr. Edward Gordon, with a full floor committee, and the list comprised 28 dances, occupying until a late hour this morning.

### A CASE OF MISFORTUNE.

#### ADDITIONAL SUBSCRIPTIONS.

In addition to the amount acknowledged in the last JOURNAL, we have to acknowledge the receipt of the following sums:

F. G. Adams...	\$1 00	Florence H. Tay-	
J. A. Alcorn....	1 00	lor.....	\$2 00
T. G. Longshore	1 00	Bushnell, Ill....	1 00
A. W. Lloyd....	50	Lee Mantle.....	2 00
T. E. Goode....	1 00		

#### Through Mr. William Holmes.

D. K. Smith, for		J. A. Townsend	\$5 00
88 Telegraph		Cape Cod Opr...	1 00
Employees on		A. Stranger.....	1 00
T. P. & W. Ry. \$24 00		A. F. Loddle....	1 00
R. E. Kearon....	1 00	E. P. Tebeau....	2 50
Pittsfield, Me....	50	J. V. Carter.....	5 00
Albany, N. Y.,		Salt Lake City	
Office .....	16 00	Oprs. ....	11 50
A. Thompson....	1 00	Nashville Oprs..	11 50
J. P. Hines.....	1 00	J. W. Ward....	1 00
W. U. Employ-		E. W. Barnes....	1 00
ees at Philadel-		Cash.....	1 00
phia .....	41 00	C. R. Slade.....	2 00

Total .....\$137 50

Previously acknowledged..... 192 25

Grand Total .....\$329 75

This timely aid, so generously afforded, has brought warmth, both of body and mind, to our unfortunate brother and his family. He desires, through us, to express his grateful thanks to these many unknown friends. It is a pleasure for us to comply with his request.

### AMERICAN ELECTRICAL SOCIETY.

A regular meeting of the American Electrical Society was held at Chicago on Wednesday evening, January 20th, the President, Gen. Stager, in the chair. The meeting, which was quite largely attended, was the most interesting of any which have heretofore been held. After the transaction of routine business, Mr. C. H. Haskins presented to the notice of the Society a repeater, which was simply a condenser, and which worked admirably well upon an artificial circuit of 1,200 miles, in the presence of the Society. Mr. Haskins said that he did not claim the system to be perfect, in fact it was crude, and he hoped that further experiments would be made by the members. He, however, had tried it on a circuit from Milwaukee to St. Paul, and back by another wire, the condenser repeater being at St. Paul and requiring no attention there. The sending and the receiving instruments were placed side by side at Milwaukee, and signals sent upon one wire reproduced on the other instantaneously. The distance from Milwaukee to St. Paul is 400 miles—the entire circuit being 800 miles in length. Of course the arriving signals were produced by the induced current.

At the next regular meeting, to be held in February, Mr. F. W. Jones will read a paper upon and illustrate the working of the quadruplex system.



# ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from Page 42.)

The CHAIRMAN. The reason I asked the question was, because I noticed in one of the citations of Mr. Lowrey, that Mr. Scudamore says, "I have not taken into account what the post-office will save by the amalgamation." I made a note of it in order to inquire whether the post-office has saved anything by that, and whether it may not be true that although the accounts for the telegraph have shown a deficit, the Post-Office Department has gained a corresponding sum, so that, on the whole, there has not been a deficit.

Mr. PRESCOTT. On the contrary many things are got out of the post-office for the benefit of the telegraph, while the post-office gets nothing in return. This is shown in the case of Mr. Scudamore, whose entire services are devoted to the telegraph, but whose salary is almost wholly derived from the post-office; the post-office paying him £1,500 per annum, and the telegraph £300.

The telegraph business of the United Kingdom is done at 3,670 postal telegraph offices, and 1,804 railway telegraph offices.

Of the postal telegraph offices there are 2,788 offices in which the postmasters themselves provide for the work, the commissions or allowances for which vary from three shillings to two pounds twelve shillings per week, the average being ten shillings.

For this sum the postmaster has to provide a space on his counter, or in some other convenient part of his shop or office, for a slab or desk which can be screened from the observation of bystanders, and on which the public can write their messages; a place for the instrument and batteries; an operator to work the instrument during at least twelve hours daily, on week-days, and one or two hours on Sundays; and a messenger to promptly deliver the messages received.

There are 262 receiving houses in London and its suburbs, at which the work is provided for wholly by the receiver, the commissions or allowances at which amount to £8,406 per annum, or £32 each.

There are 97 district and branch offices in London, at which the department provides for the work, employing 1,340 persons, at an average salary of £35 16s. and 9d. per head.

There are 456 postal telegraph offices, at which the department provides for the work, employing for this purpose 3,189 officers and clerks, and 2,054 messengers, at an annual cost of £236,512, or about 17s. 4d. a week per head. Of this amount the postmasters receive £7,216 14s., or about six shillings a week per head.

The allowances to head postmasters for personal responsibility, work and supervision, depends partly upon the number of circuits working out of their offices, and partly upon the number of messages forwarded. For each of the first five circuits, £3 per annum is paid; for each of the next five, £1 10s.; and for each additional circuit above 10, £1 per annum.

The payment per message is at the rate of one farthing for each forwarded message. A minimum and maximum limit has been fixed, within which the above scale shall take effect, by which the remuneration to a head postmaster cannot be less than £10, nor more than £50, except by special arrangement.

The proportion which the telegraph and Post-Office Departments, respectively, bear of the postmaster's salary, may be estimated with approximate accuracy by one or two examples. The salary of the postmaster at Oxford is £500 per annum. Of this amount the Post-Office Department pays £480, and

the telegraph £40. The salary of the postmaster at Glasgow is £1,000 per annum. Of this £100 is paid by the telegraph, and £900 by the post-office. In Birmingham the postmaster receives £100 per annum from the telegraph, and at Newcastle-on-Tyne £75. Judging from my own personal observations, as well as from conversations with the postmasters at all the above-mentioned places, I should think they devoted more of their time to the service of the telegraph than to that of the post-office.

Mr. LOWREY. Now, on the subject of the cost and profits of running government telegraphs, I will refer to a statement of the telegraph business contained in the annual report of the Postmaster-General for the year 1873, at page 188, entitled "*Comparative Statistics of the different States of Europe. Furnished by L. Curchod, Director of Telegraphs of Switzerland.*" By a comparison of this statement with the original reports from the same countries, which we have here, we find several important figures left out from this summarized statement. It is not for me to charge the manipulation of these figures on the Post-Office Department. It is possible, perhaps probable, that the paper here printed is exactly the one received from the Director of Telegraphs in Switzerland; but there is known to be a good deal of partisanship about this business, which naturally makes one suspicious when such suppressions of fact appear. I find, on reading the voluminous discussions which have taken place heretofore between some gentlemen of the Post-Office Department, including (I mention the name with great respect) the Postmaster-General, and persons representing the telegraph interest, that there has been a great deal of heat on the part of advocates of governmental interference. Anger is a great disturber of those calmer states of mind which tend to charity and fair dealing. And there arises a suspicion that there may be somebody in the Post-Office Department susceptible of being irritated by successful opposition to a pet project, to such a degree as to be capable of making the alteration to which I call your attention. Even without these alterations it would be evident that the business of telegraphing, to which this Government is invited with so much fervor, has proved unprofitable in one of the most populous countries of Europe.

Belgium is a country very compact, as you know, thickly settled, lying in the way of travel, and across which telegraph lines are extended for necessary communication between France and Germany and other countries lying contiguous to its borders. It does a very large telegraph business. This telegraph business is of three sorts in Europe. Internal business, as its name indicates, is business beginning and terminating within the territory. International business is business beginning within the territory and going beyond it, or beginning beyond it and terminating within it. Transit business passes over the wires, and nothing is done concerning it in that country. Now, Belgium being a small country, lying between other countries, is situated so as to do a large transit business; that is to say, it has wires stretched over its territory between France and Germany, along which messages are shot and concerning which no labor takes place in the Belgium offices. For these transit messages higher prices are charged than for the internal messages. It is from the international and transit messages that Belgium gets her largest telegraph revenue. Now, notwithstanding, from the geographical situation of Belgium, it necessarily does a very large international and transit business, here is the state of its telegraph accounts for 1872:

France.	
Total receipts.....	1,773,231.90
Total expenses.....	1,859,959.00

Thus you perceive that there is a loss on the telegraph business in Belgium.

"It will be noticed," says the official report, "that the expenses of the telegraphic service increase gradually, owing to reasons quite independent of the number of private messages transmitted. The increase in the expenses is due to the increased compensations paid to the newly-appointed personnel, the increased wants of railroads, and the increase in the number of offices. The improvements of the system constantly necessitate expenditures, which remain unproductive for the most part, and they are not compensated by the increase of business."

In Switzerland, the country constantly referred to by Mr. Hubbard as offering the best example of the union of the post-office with the telegraph (in fact the only one except England), we have this state of the accounts for 1872, was furnished by our Postmaster-General:

France.	
Total receipts.....	1,679,177.37
Total expenses.....	1,272,697.14

In investigating the case of Switzerland, which has been relied upon for some years past for argument in support of the plan proposed, we discover that the accounts published by the Postmaster-General are mutilated. Whether that was done in Switzerland or here I cannot know, but it is to Swiss public documents that we refer to correct the error. It is hard to believe that any person in the Post-Office Department should have garbled the figures, and equally hard to believe that a prominent Swiss official should, without motive, have sent to the United States a garbled account which his own published accounts would enable any one to detect. I shall show to the Committee in a moment the original Swiss document, by which it appears that there is to be added to the expenses 450,000 francs for construction and maintenance of line, the effect of which is to place the expenses of the Swiss Government for the telegraph above the receipts. The 450,000 francs is expressly stated in the Swiss document to be for the construction and maintenance of lines, which, of course, is a part of the yearly expense, (the total construction for the year was only one hundred and fifty-four miles,) and that the deficit, according to the Swiss accounts, (which were doubtless sent to the Postmaster-General,) was for that year 41,346 francs.

On reference to the report of Mr. Hubbard's argument, I find that I said, "I presume the high proportion of social messages in Switzerland is owing to the fact that there is so much travel in the country, and that it is the country to which all travelers are attracted in certain portions of the year." To that remark Mr. Hubbard is reported as saying: "What my friend says in regard to the Swiss business is scarcely correct. If he will study the business, he will find that there is no difference between the proportion of social and other business in Winter and Summer." Being so sharply brought to book, I had an investigation made, and these are the facts: The yearly report of the Swiss telegraph administration states the number of internal messages sent in January, 1873, as 98,860, and in July, 1873, as 182,750. The number sent in February were 93,615, and in August 204,641. The same proportion is found between Winter and Summer months in previous years. The proportion of social and business messages sent each month is not given; but the total business per year, including internal, international, and transit, gives the percentage of social messages at 51.7.

The rate for the transmission of messages in Switzerland has never been reduced to 10 cents, as asserted by Mr. Hubbard, except upon inland mes-

sages—that is, upon messages which are received, transmitted, and delivered in Switzerland. Upon international messages, which are either sent from Switzerland into other countries or received from other countries into Switzerland, the Swiss portion of the tolls is 1 franc, and Switzerland also receives 1 franc upon each transit message which passes through her territory in passing from France into Germany, or from Germany into France, or between any other two countries. It is this tax upon a class of messages which are neither transmitted nor delivered in Switzerland, but merely permitted to pass through her territory, which enables her to send messages between stations in her own country at 10 cents without serious loss; for it must be understood that even with a tax of 1 franc per message upon a large class of foreign telegrams upon which she performs no service, the telegraph in Switzerland is not self-supporting at the rates now charged. I have here the official report for the year ending December 31, 1873, from which it appears that the gross receipts for the transmission of messages were 1,596,007 francs, and the expenses 1,750,640 francs, showing a deficit of 154,633 in the working expenses. This was partly made up by allowances or contributions from the communes, amounting to 87,076 francs, by reimbursements for construction of lines, amounting to 16,666 francs, and by receipts from other sundry sources, amounting to 11,847 francs, leaving the actual deficit for the year 39,042 francs.

In the account for Germany, as given by our Postmaster-General, we find the annual receipts stated at 12,119,145 francs, and the expenditures at 11,926,458 francs. But here again we find an error. To this account for Germany we find, by examination of the official documents which I have before me, that there is to be added the sum of 1,108,417 francs for expenses of construction of lines. No person, in making up this account, could leave that out with a fair purpose.

The addition which I shall make is of a sum of 295,042 thalers, which is for extraordinary expenses during the year. That makes a deficit again in the German account.

The CHAIRMAN. That last item is for extending the line, and does not go properly into the expense account for the year. Is it not rather a capital account?

MR. PRESCOTT. It is of the nature of a capital expenditure certainly. But the Government never derives any revenue from these lines. There is always an outgo every year, and never any income. During the last ten years the expenditures have exceeded the receipts by 1,735,060 thalers, and of the receipts 260,910 thalers were derived from other sources than for telegraphing, so that there has been actual deficit since 1862 of about 2,000,000 thalers.

In a personal interview which I had in Berlin last year with Colonel Meydam, the Director-General of the German telegraphs, he said that the rates for the transmission of telegrams in Germany were too low to meet the expenses of the service, and that the pay of the employes was insufficient to enable them to live comfortably. He also said that he should endeavor to have free quarters furnished by the Government to such of the employes in the telegraph service as had families, to compensate for the inadequacy of their wages.

The CHAIRMAN. How long has the Government been running the telegraph in Germany?

MR. PRESCOTT. In North Germany since 1850, and in South Germany and Austria since 1848.

The Postmaster-General's table gives the receipts

in Austria in 1871 as 6,294,419 francs, and the expenses as 7,087,100 francs, showing an apparent deficiency of only 792,681 francs; but, as in the cases previously recited, he omits to give the amount expended under the head of extraordinary expenditures, amounting to 1,034,530 francs, and making the deficit for the year 1,827,211 francs.

The total receipts in Austria from 1848 to 1871, inclusive, were 35,564,790 florins; expenditures, 45,057,310 florins; excess of expenditures over receipts, 9,492,520. Of the expenditures 34,822,812 are placed under the head of ordinary, and 10,234,498 under the head of extraordinary account.

In the statement regarding Sweden, the Postmaster-General's table is remarkably inaccurate, the receipts being given as 1,776,909 francs, and the expenses 1,094,146 francs. The official report, however, gives the total receipts as 1,397,211 francs, and the expenditures as 1,312,947 francs.

The following is a correct abstract of the official report of Sweden for 1872:

Receipts.	Riksdalers.
For internal messages.....	553,625
For international messages.....	423,755
For sundry receipts.....	11,228
	993,608

Expenditures.	Riksdalers.
Salaries of employes.....	526,917
Maintenance of offices, &c.....	207,906
Construction of new lines, &c.....	198,862
	933,685

The value of the riksdaler is 140.62 centimes; 10 riksdalers are equal to 15 francs.

The Postmaster-General's table makes the receipts in Sweden 379,698 francs *more*, and the expenses 218,801 francs *less* than the official report, thus making a difference of 598,499 francs from the true figures.

The Postmaster-General's table is erroneous in respect to Holland also. He states the expenditures as 1,974,661 francs for 1872, while the official report gives them as 1,031,130 guilders, or 2,191,151 francs.

The total receipts in Holland for 1872 were 641,710 guilders, and the expenses 1,031,130 guilders, making a deficiency of 389,420 guilders. Of this sum, only 92,130 guilders were expended for construction.

The Postmaster-General's table gives the receipts of the Russian telegraph for 1872 as 17,120,208 francs, and the expenditures as 12,912,934, showing an apparent profit of 4,207,274 francs. The Russian official report for the same year gives the receipts and expenditures as follows:

Receipts.	Roubles.
From internal messages.....	3,374,947
From international messages.....	744,805
From sundry receipts.....	69,528
	4,189,280

Expenditures.	Roubles.
Ordinary.....	3,145,024
Extraordinary.....	1,035,757
	4,180,781

The Postmaster-General's table entirely ignores the expenditure of 1,035,757 roubles, equal to \$928,606, for construction of lines, and yet this expenditure is made every year, and is as necessary a portion of the yearly expenditure as the wages of the employes. From 1862 to 1872, Russia has expended \$5,648,807 in construction, all of which, according to the Postmaster-General's table, would be omitted from the expense account.

In the Postmaster-General's table the expenditures of the Italian telegraphs for 1871 are stated as 4,865,634 francs, while the official report gives them as 4,980,199 francs, the difference of 693,564 francs

being the amount expended for construction. This same omission occurs in the Postmaster-General's tables respecting all the countries the reports of which I have examined, with the exception of France, (which had no construction in 1871,) and the omissions are, I presume, intentional. It seems to me, however, that in preparing the table the fact of the omission of many millions of dollars from the expenditures should have been alluded to in some manner, on the general principle that if a statement is worth making at all it is worth making accurately.

MR. LOWREY. I now return from the long digression into which I have been led, by a reference to the English account for 1872, as contained in the Postmaster-General's report. The total receipts are put down at 25,441,650 francs, and the total expenses at 22,842,225 francs, making an apparent profit. Now an investigation of the English accounts shows that there has been left out of those accounts what properly should go in, the larger part, if not the whole, of the sum of £1,131,175, or over 25,000,000 francs.

I will ask the Committee, for the sake of greater brevity and accuracy, to allow Mr. Prescott, who has spent much time in getting at these facts, to state them.

MR. PRESCOTT. I have here an English blue-book, entitled Second Report from the Committee of Public Accounts, ordered by the House of Commons to be printed July 9, 1873. Pages 118 and 119 of the Appendix of this book contain an abstract of the capital account of expenditure on post-office telegraphs to 31st December, 1872. The expenditures on this account were as follows:

## TELEGRAPH UNDERTAKINGS.

1872.	£	s.	d.
January.....	63,231	8	11
February.....	290	9	0
March.....	38,927	10	7
April.....	1,663	7	10
May.....	772	8	2
June.....	4,742	4	4
July.....	6,516	17	0
August.....	5,435	2	7
September.....	615	17	0
October.....	3,425	13	10
November.....	106	5	0
December.....	223	6	6
	126,040	1	9

## TELEGRAPH EXTENSIONS.

1872.	£	s.	d.
January.....	1,735	3	8
February.....	8	14	0
March.....	664,134	7	7½
April.....	9,687	1	2
May.....	4,398	8	11
June.....	5,303	18	9
July.....	6,639	2	7
August.....	3,929	19	3
September.....	8,333	14	5
October.....	179	1	8
November.....	783	17	7
December.....	295,106	1	1½
	960,245	10	7½

## PENSIONS.

1872.	£	s.	d.
January.....	924	5	6
February.....	3,813	11	4
March.....	838	3	4
April.....	499	1	6
May.....	2,085	0	0
June.....	2,120	17	6
July.....	4,259	4	0
August.....	4,715	0	0
September.....	1,960	19	10
October.....	1,089	19	6

November.....	1,355	10	0
December.....	1,228	6	0
	24,889	18	6

## RECAPITULATION.

Telegraph Undertakings.....	126,040	1	9
Telegraph Extensions.....	980,245	10	7
Pensions.....	24,889	18	6
Total.....	1,131,175	10	10

The report does not contain a detailed account of the entire expenditure given above, but on page 169 of the appendix there is a statement signed by George Chetwynd, Receiver and Accountant-General of the General Post-Office, showing how the sums entered in the capital account, as expended in March, 1872, were made up.

Under the head of telegraph undertaking, the following items appear:

Paid to Isle of Man Telegraph Company.....	17,722	16	3
Paid to Isle of Man Government.....	1,403	6	0
Jersey and Guernsey Telegraph Company, on account.....	500	0	9
Bowls and Punter, Newcastle.....	385	0	0
Lord Fermay's Arbitration:			
Printing, &c.....	575	16	2
Map.....	5	13	6
Mr. Casserly, traveling.....	4	15	6
Mr. H. J. Green.....	3	19	6
Law charges.....	821	2	11
British and Irish Magnetic Company....	22,506	0	0
	38,927	10	7

The sum of £644,936 3s. 7½d., under the head of telegraph extensions, was charged in the first instance to the vote—that is, appropriations for working expenses—and was afterward transferred to the capital account. This expenditure was spread over the whole year ended the 1st March, 1872. The items are as follows:

Engineering salaries.....	51,533	11	3½
Traveling.....	25,491	10	2½
Labor.....	130,395	2	8½
Materials.....	405,165	10	1½
Incidentals.....	32,350	9	3½
Total.....	644,936	3	7½

Two small sums, amounting to £25 9s. 8d., were expended in March, 1872, for traveling and extensions by railway companies, and the sum of \$19,172 14s. 4d. was expended by the office of works during the six months ended March 31, 1872, making a total sum charged to telegraph extension in March of £664,184 7s. 7½d.

(To be Continued.)

**CONVERSION OF DIAMOND INTO GRAPHITE BY ELECTRICITYES.**—Diamond, like ordinary charcoal, is converted into graphite when heated by the electric current. The investigations of Jaquelin, Depretz, Berthelot, Silliman and others show that carbon and diamond are converted into graphite even under the influence of a temperature produced by a battery of 500 or 600 elements. The heat produced under these circumstances was so great that the carbon was softened and even evaporated. Depretz allowed an electric current from a battery of 600 cells to pass through carbon points in rarefied air for a month, and observed the softening and volatilization of the carbon, for the sides of the glass vessel were covered with a black, crystalline deposit.

**ACTION OF THE ELECTRIC CURRENT ON THE ORGANS OF THE SENSES.**—*T. L. Phipson.*—It results from experiments made by the author that the action of a galvanic current on the organs of sensation always appears at the positive pole, except at the moment where the negative pole becomes in turn positive, and then an action takes place at this pole. He thinks that in these facts is found the indication of a general law applying equally to the muscular contractions occasioned by electricity, and very probably to the phenomena of induction. If we take a small zinc copper couple, plunged in acidulated water, and furnished with a platinum rheophore, and place first the zinc pole on one side of the tongue, and then the copper pole on the other side, the well-known and peculiar taste is immediately experienced at the point touched by the copper, but not on the other side. The result is the same if the positions of the poles are changed. If a stronger apparatus is used the phenomena are unaltered, but another fact is also observed—on removing the copper pole the same taste is experienced at the zinc pole. Corresponding phenomena are observed in experimenting on the organs of hearing, smell and sight.

**WANTED**—BY YOUNG MAN, FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 140, Janesville, Wis.

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My Wires were awarded the first premium at the Cincinnati Exposition of 1874, both for best "Office" and best "Insulated Line Wires."

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I could give a long list of testimonials, but depend on the merits of the Wire for patronage.

Please send for sample card and price list.

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For Philadelphia.	For New York.
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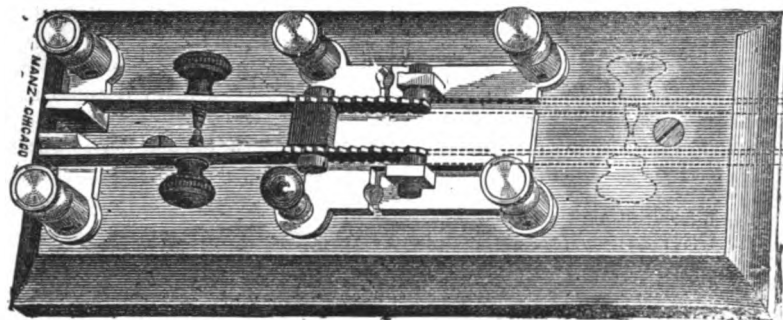
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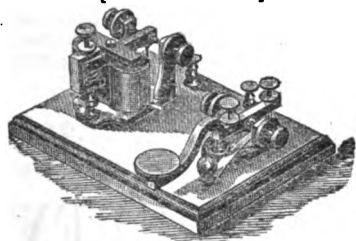
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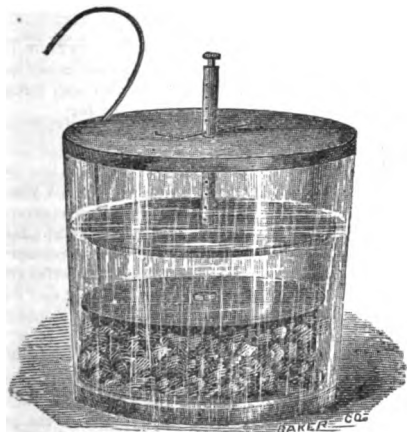
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The introduction and operation of the

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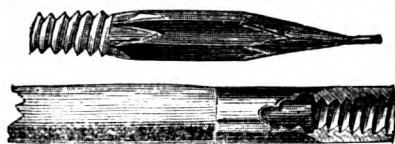
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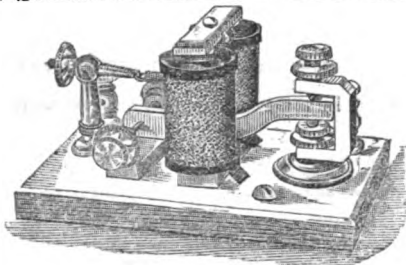
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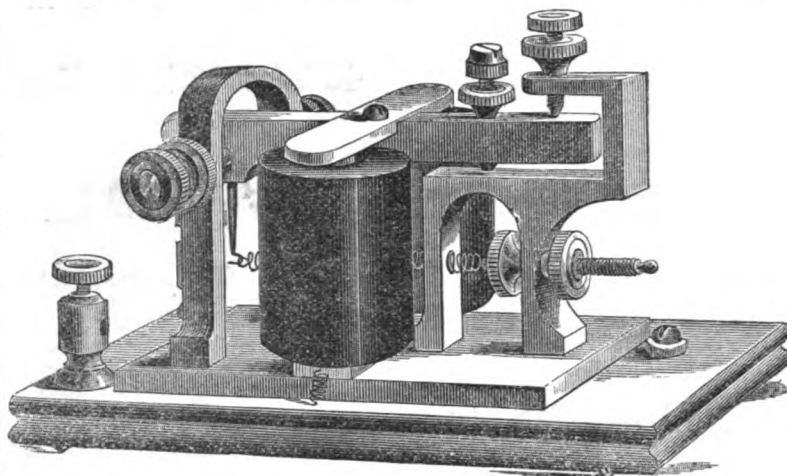
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OFFICE & MAGNET WIRE,

BRAIDED AND WOUND, SINGLE and DOUBLE,

with COTTON, LINEN, SILK;

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MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
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The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. **Every Instrument Warranted Perfect.**

**PRICE \$7.50.**

Sent C. O. D. by Express. On Receipt of Money Order, \$7.00.

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Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.; or \$8.00 if Money Order for the amount sent in advance.

The latter plan will additionally save the purchaser the Express charges for returning money.

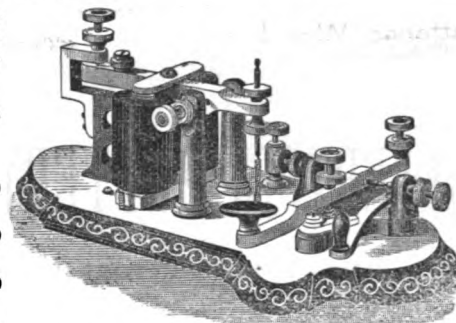
Price of single instrument, good for one mile or less, without Battery, &c. .... \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. .... 7 50

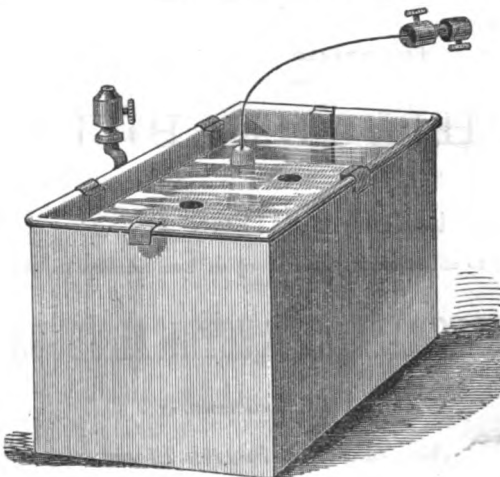
Price of single instrument, good for one to twelve miles, without Battery, &c. .... 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. .... 8 50

THIS IS WARRANTED TO BE, BEYOND ALL COMPARISON THE BEST APPARATUS ever offered for the use of STUDENTS OF TELEGRAPHY. Being excellent Morse Instruments, substantially made and nicely finished, with nothing left out of their construction which pertains to a complete sounder and key combination set; NOTHING MADE IN MINIATURE OR IN AWKWARD AND UNUSUAL SHAPE, as is done with the very cheap affairs usually offered as learners' apparatus. They are equally well suited for



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THE EAGLES METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

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For OPEN CIRCUITS, where all other gravity batteries are acknowledged FAILURES, the Eagles Battery is found to be, in every respect, A PERFECT SUCCESS.

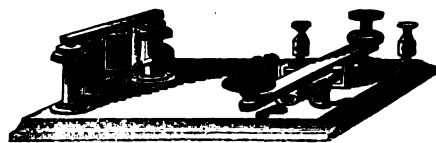
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No. 1, Square Cell, complete, - \$2.25  
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PATENTED JUNE 24, 1873.

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## Excelsior Telegraph Apparatus

For STUDENTS and AMATEURS.

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We are now prepared to furnish these unrivalled Amateur Instruments, with or without Office Outfits, in any quantity, and at a moment's notice. Our Agents may now send in their orders as rapidly as they please, and can rely upon their being promptly executed.

PRICES AS HERETOFORE.

Instrument Complete, Key and Sounder .....	\$6 50.
Instrument, with Office Outfit .....	7 50.
Two Instruments and Outfits .....	14 50.

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STANDARD TELEGRAPH INSTRUMENTS,  
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THE NONPAREIL TELEGRAPH INSTRUMENT for amateurs, learners and short lines.  
Over 2,000 of them have been sold, and the demand for them continues unabated.

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Eagles Metallic Galvanic Battery.

The demand for this Battery is rapidly increasing, and it is conceded by all who have used it to be the Best and most Economical Battery, for telegraphic and other purposes, offered to the public.

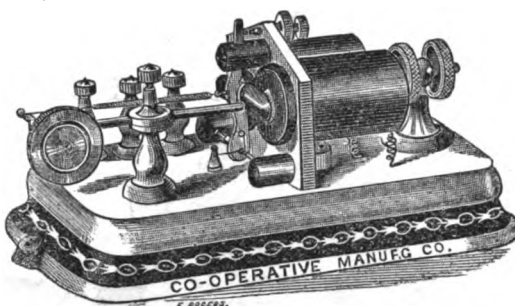
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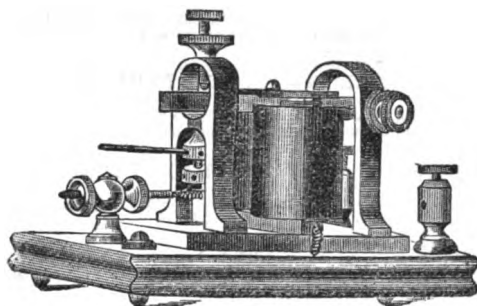
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W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. Is finely finished.

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Railroad Sounder.

This Sounder is noted for its loud, clear and firm tone, entirely free from that sharp ring peculiar to most instruments, and which eventually becomes so painful to the ear of the operator.

N.B.—We have improved our Sounders by using capstern head screw and nut, as represented in cut.

Price, \$7.

By the Dozen, \$6 50.

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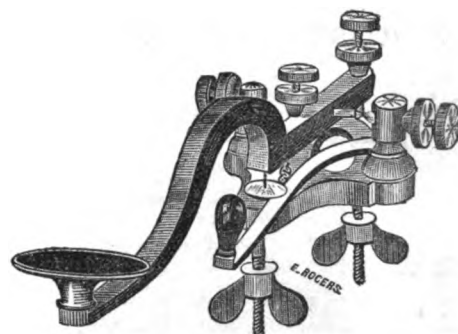
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Or to L. G. TILLOTSON & CO.,

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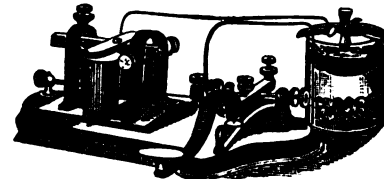
PHILADELPHIA: 54 South Fourth Street  
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No. 1 Key.

This Key is of a beautiful design, and durable in construction, and is perfect in all things which constitute an excellent working Morse Key. No. 1 Key Curved or Straight Lever.

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A complete outfit, embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practising or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined. The instructions are clear and practical, and contain all information necessary for the student. All technical terms and expressions are avoided, as they only perplex and make the road to knowledge more difficult.

Learners' Instrument complete, \$9.50

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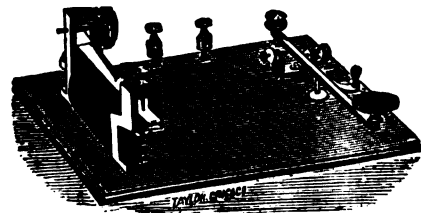
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## THE AMATEUR'S Telegraph Apparatus.

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With this Instrument is furnished

A Complete Outfit for the Student,

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PRICES:

Complete Outfit .....

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" " with Out-Out and Lightning Arrestor

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GEO. H. BLISS & CO.,

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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 5.

NEW YORK, MARCH 1, 1875.

WHOLE NO. 176.

## THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's *Elektromagnetische Telegraph.*]

(Continued from Page 358, Vol. VII.)

### THE COURSE OF THE CURRENT AND THE ACTING TOGETHER OF THE ELECTRICAL AND MECHANICAL POWER.

Upon the instrument table (Figure 7) are two binding screws P L, of which P is connected with one of the poles of the sending battery and with the pins *k* under the sledge. L is connected with one end of the coils of the electro-magnet E and the line. Also upon the table are metallic plates 1 and 2, and a contact arm which is connected with a metal rim I. The rim I is connected to the metal parts of the entire work, and the plate 1 is in connection with the other end of the electro-magnet. When the arm is placed on the plate 1 the instrument is in position for receiving, and for sending when the arm is on plate 2. In receiving, when the arm is upon the plate 1, a current arriving from the other station proceeds through L, magnet E, contact arm and plate 1, to the metallic parts of the instrument, thence to the rotating axis Q (Figure 4) of the sledge, and then, as none of the pins *k* are raised, from the contact screw *v* to the spring *r*, and over P and Q, to the ground.

The unison of the sending and the receiving instruments is effected in the following manner:

The sending operator depresses one of the keys—for example, the letter B—several times in succession. If, at the receiving station the same letter is printed at each impulse, the synchronism is perfect and needs no adjustment. If, on the contrary, different letters are printed in succession, the synchronism is not perfect and needs regulating. It can easily be seen by the succession of letters whether the instrument is running too fast or too slow.

If the letters printed upon the paper at the receiving instrument run ahead, so to speak, as B C D, etc., then the receiving instrument is running faster than the sending. If the letters run back, as C B A, then it is running too slow. In either case the adjustment of the sliding weight W (Figure 7), higher or lower upon the vibrating tongue Z, by means of the crank G will bring both instruments in unison. With the pendulum governor the same result is attained by moving the globe P by the adjusting screw *v* (Figure 8).

When the instruments are brought to a corresponding speed the message is transmitted letter by letter by depressing the keys at the sending station. As we have seen before, at the moment a contact pin is brought forward by the depression of a key, it is struck by the steel disc upon the sledge, thus closing the circuit of the line at exactly the same time as the

letter on the type wheel, corresponding to the key depressed, is over the impression roller. After each word the blank key is depressed and the paper is then moved the space of a letter further without receiving an impression.

In Figure 19 is represented the usual circuit arrangement of the Hughes system. K represents a key, K' the connecting point of battery L B, *k* the pin appertaining to the key, Q the upper and P the lower part of the sledge axis, S the contact disc of the sledge, *v* its contact screw which is in contact with *r*, as long as S is not raised (it then connects Q with P as a conductor), E the electro-magnet, L the wire, T T' the ground plates, and L B the battery.

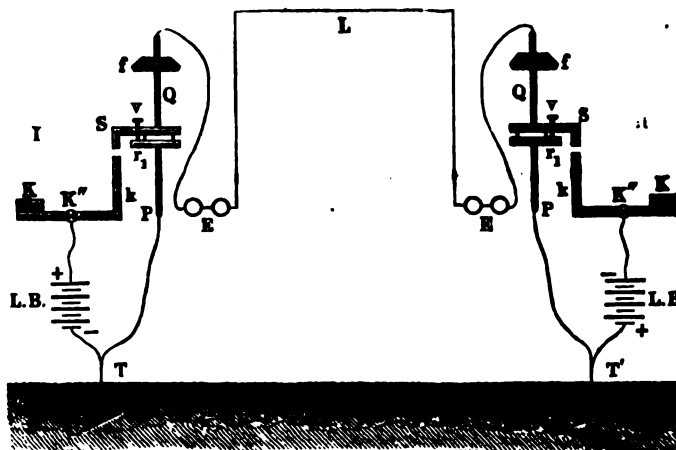


Figure 19.

Now, when at Station I a key is depressed, for example the letter M, the circuit is closed as soon as the rotating sledge comes in contact with the pin *k*.

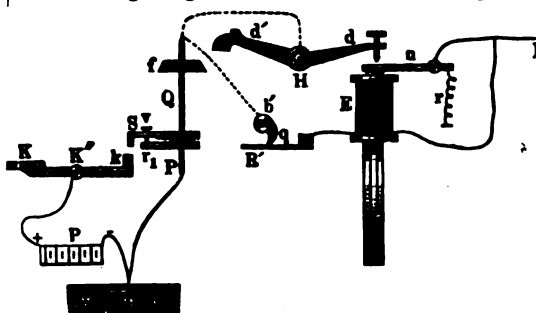


Figure 20.

The current from L B then flows from + to K' & S (*v* being separated from *r*, and thus S from P) Q f E and line L to Station II. At Station II, through E f Q *v* *r*, (as S is not raised, and consequently *v* is in contact with *r*) P T' to the ground.

For a still better connection of the sledge axis Q with the metallic body of the apparatus than that afforded by the bevelled wheel and the spring which presses on the upper end of the sledge axis, Hughes placed on the upper bed plates of axis Q a powerful spring which presses sideways upon the axis. The closing of the circuit consequent upon the depression

of the key sets the printing work of the apparatus in action, the operation of which has heretofore been fully described. Precisely the same effect is produced by the depression of any other key, and as the letters upon the type wheel correspond in position with the pins of the keys, when both instruments revolve at the same rate of speed and start from the same point, the instant that the sledge comes in contact with a pin, that instant the corresponding letter upon the type wheel is over the impression roller and is taken off upon the paper.

As we have seen, only one impulse of the current, and that of very short duration, is required to effect the transmission of each letter. This is a very great advantage, but it should not be overlooked that, as shown in Figure 19, the intensity of the current upon its arrival at the distant station can never be as great as at the starting point, owing to the fact that during transmission only the battery at the sending station is in action, and to the inevitable secondary currents in the circuit. The adjustment of the magnet has therefore to be changed whenever the character of the instrument is changed from sending to receiving.

In order to overcome this inconvenience, Mr. Hughes has proposed an alteration in the circuit arrangements which is very ingenious, and seems to be well adapted to its purpose. Figure 20 shows this arrangement. *dd'* is the lever, which, through the armature *n*, at each action of the current, couples axis *b*, to printing axis *b'*. As shown heretofore, axis *b'* carries a number of cams. One of these cams, *q* (figures 10 and 11), at every revolution of the axis, is brought in contact with a spring *ll'* (Figures 20 and 11), which is in a shunted connection with the line through the magnet. This contact is maintained during the time the axis is at a standstill. The cam is brought into connection with the battery upon the depression of a key, through contact pin *k* and the sledge. The duration of this contact during the time of the revolution of the cam is so calculated that the current has the power only to cause a movement of the armature at the sending station, but almost at the same moment the current in full force flows upon the line by another route, and with equal power operates the magnet of the receiving station.

Suppose now that at the sending station a key, K, is depressed. The current, in the first place, will take this course: From + pole to K' & S (when the disc comes in contact with pin *k*) Q f *b'* R', magnet E and line L to the distant instrument and to the ground. This current, however, is too weak to release the armature of the receiving instrument, as it has to pass through the coils of both magnets and the shunts. At the sending instrument, where at this time it has a straight course, it releases the



armature, but as soon as the armature comes in contact with the contact screw of lever *d d'*, the cam *g* having left its contact with *R'*, the circuit is made through *d d'* and *n*, cutting out the magnet of the sending station; the current by this route has sufficient power to release the armature of the receiving instrument, and thus to procure the action of the printing work.—(To be continued.)

### CABLE TELEGRAPH PRIVILEGES.

OTTAWA, Ont., Feb. 22, 1875.

The correspondence relating to the termination of the telegraph cable arrangement is printed.

The first document of importance is a minute of the Council, dated June 4, 1874, accompanying the act passed last session. The minute sets forth that the bill reserved is one of some importance, and may be possibly considered to prejudice interests and rights of property of Her Majesty's subjects, non-resident in Canada. At the same time the minute goes on to say that the advice to the Governor General that the bill should be reserved was given merely in deference to the language of the royal instructions, and not from any conviction or belief that the bill in any way interferes with, or is prejudicial to, the rights of the Anglo-American Company, or of any other company with similar objects or with similar rights. The minute expresses the opinion that no company in existence possesses rights and privileges in Canada which can be in any way affected by the reserved bill. The next document requiring notice is another minute of the Council, dated October 2, 1874, dealing principally with the alleged monopoly in connection with the Prince Edward Island line, and disposing of any such claims. The minute concludes as follows: "There can be no doubt but that the Parliament of Canada fully considered the effect of this bill, and that although it was urged on behalf of the Anglo-American Company that the interests of the proprietors would be seriously affected if the company was obliged to give up its occupation for cable purposes of the shores of Canada, which, by the provisions of the bill, it can only retain by consenting to give equivalent privileges to any other company in Newfoundland. The Parliament of Canada considered this occupation to be only on sufferance and determinable at will; that such occupation appears to have been taken and used without any authority, which would constitute a right; but that such occupation can only be lawful and continue by compliance with the terms of the Act and on condition that the company yield a like privilege to any other corporation in Newfoundland; that no franchise in favor of the Anglo-American Company existed in any part of Canada, and that the company could not lawfully assume to exercise any such rights except with the sanction of the Parliament of Canada; that it is obvious that Parliament could not recognize the position claimed by the Anglo-American Company, inasmuch as by doing so it would admit that, by virtue of an Act of the Parliament of Newfoundland, the company gained and could retain in Canada, without the sanction of its supreme authority, privileges in the nature of a monopoly. In conclusion, the Committee desire to call attention to the fact that while the bill is plainly within the powers and jurisdiction of the Parliament of Canada, the original grant by Newfoundland was declared contrary to imperial policy. (See despatch, 18th January, 1858.) The Committee submit that it would be in direct conflict with the spirit of the above despatch now to interfere with the Parliament of Canada in the exercise of its constitutional right to declare on what conditions alien corporations

should be permitted to make use of any portion of its territory."

Then follows a long statement signed by Sir James Anderson and Mr. Grant, Secretary of the Anglo-American Cable Company, arguing in favor of that company's pretensions.

Lord Carnarvon, on the 29th of October, replied as follows:

The subject to which this bill relates is, in my opinion, one of those with which the Dominion Legislature has been, under the ninety-first and ninety-second sections of the Imperial British North American Act of 1867, expressly empowered to deal. It seems to me to be clearly within the competency of the Dominion Government and Parliament to legislate without any interference on the part of the Government of this country upon a local question, such as forms the subject-matter of the bill, involving as it does no points in respect of which it would appear necessary that imperial interests should be guarded or the relations of the Dominion with other colonial or foreign governments controlled. I am well aware, from numerous representations which have been made to me on both sides that the reserved bill affects the pecuniary interests of many persons not resident in Canada, but Her Majesty's Government is not on that account called upon to review the decision arrived at by the Legislature of the Dominion. Looking to the large intercourse maintained between Canada and this country, and the extent to which British subjects residing out of Canada, hold real and personal property and are interested in joint stock enterprises within the Dominion, it is obvious that if the intervention of Her Majesty's government were liable to be invoked whenever Canadian legislation on local questions affects, or is alleged to affect the property of absent persons, the measure of self-government conceded to the Dominion might be reduced within very narrow limits. It is to the Dominion Government and Legislature that persons concerned in the legislation of Canada on domestic subjects and its results must have recourse, and this government cannot attempt to decide upon the details of such legislation without incurring risk of those complications which are consequent upon a confusion of authority.

While, therefore, I entirely appreciate the action of your ministers in reserving that bill, I am of the opinion that any further consideration of the subject should be given by that body whose province, as I have observed, it is to deal with such questions, and that I cannot properly assume the functions of deciding between the conflicting views of those who have addressed me, whether in favor of or against the policy embodied in this measure.

In order to enable this to be done I have decided to leave the present bill in abeyance, and to tender no advice to Her Majesty respecting it.

CARNARVON.

On the 19th of November Lord Carnarvon sends Lord Dufferin another brief despatch, covering one he had transmitted to the Governor of Newfoundland, which closes the correspondence:

EARL OF CARNARVON TO GOVERNOR SIR J. HILL.

DOWNING STREET, Nov. 17, 1874.

SIR: I inclose for your information and for communication to your ministers a copy of a despatch which I have addressed to the Governor-General of Canada with regard to a reserved bill of the Dominion Parliament to regulate the construction and maintenance of marine electric telegraphs. Until the course to be taken by Her Majesty's Government in this matter had been decided, I thought it expedient to defer answering your despatch (No. 431) of May 9, in which you

enclosed a minute of your Executive Council, inquiring whether Her Majesty's government would, upon terms to be hereafter agreed upon with the local government, undertake the purchase claimed by the government of Newfoundland under the Act, cap. 2, of 1854, incorporating the New York, Newfoundland and London Telegraph Company, with a view of terminating the monopoly conceded by that Act.

The decision which has been arrived at to take no action with respect to the Dominion Reserved bill, in order that, if thought desirable, a fresh bill may be introduced next session, would seem to render it unnecessary, or perhaps impossible, to decide at the present moment whether the Newfoundland government should take any steps to terminate the monopoly under the provisions of the Act, cap. 2, of 1854.

In the event, however, of a sum of money becoming payable, either by arrangement or award, for that purpose, Her Majesty's government do not perceive that they could properly invite Parliament to contribute a portion of that payment. But having regard to conflicting legal opinions to which you refer in your despatch, I have thought it desirable in the interest of your government to consult the law officers of the Crown as to the subject-matter comprised within the power to purchase conferred upon the Newfoundland government by section 15 of the Act above referred to; that is to say, whether the Government could claim to buy out the whole interest of the company for the actual appraised value of the telegraph lines, wires, cables, apparatus, vessels and all other appliances connected therewith, or whether any further claim could be made by the company for compensation for loss of monopoly, which would be terminated by such purchase, or for any other right of interest conveyed by the Act. And further, as to the course which it might be advisable that the Government of Newfoundland should take with a view to determine its power to purchase. I am accordingly advised that the expressions "other property" and "all other property connected therewith," used in the fifteenth section of the Act of 1854, were intended to comprise merely property of the same nature as the property mentioned in parts of the section immediately preceding those expressions, and, therefore, that upon payment of the amount awarded as the value of the telegraphic lines, wires, &c., under the provisions of the above-mentioned section, the undertaking of the telegraph company will become vested in Her Majesty, and that the telegraph company will not be able to insist upon arbitrators or an umpire awarding an amount of compensation for the good will of the concern or loss of the monopoly. If it had been the intention of the Colonial Legislature that the telegraph company, upon the exercise of the Government of the power conferred upon them to purchase the undertaking, should not only retain the lands, &c., granted to the company, but also be paid a sum for the loss of their monopoly, it may be presumed that a very explicit provision to that effect would have been found in the act.

With reference to the course which the Newfoundland Government should take if it is decided to proceed in the matter, I am advised that it would be desirable for that Government to follow exactly the directions given in section 100 of the Act; and in the event of the company neglecting to take any of the steps incumbent on them—*ex. gr.*, to choose an arbitrator, to call in the aid of the Supreme Court of the colony to enforce compliance with the statutory requirement.

An opportunity would then perhaps arise of obtaining a judicial determination as to the rights re-

served to the Government by the fifteenth section. In thus conveying to you advice which I have received on the subject, I do not lose sight of the reason which has rendered your Ministers reluctant to take steps for exercising the rights of pre-emption, namely, apprehension that the award might possibly be made on the opposite principle to that which I have informed you I am now advised to be the correct one, and might consequently involve the payment of a larger sum of money than Newfoundland could undertake, unassisted, to pay. Looking to all the circumstances, your Ministers will probably be of the opinion that it is not likely that any excessive sum would become payable; but on this subject it might be of advantage for the Government of Newfoundland to confer with the Dominion Government, and consider whether some terms could be laid down on which any payment found necessary might be apportioned between Canada and Newfoundland.

CARNARVON.

To Governor Sir S. J. HILL, K. C. M., G. C. B.

### ELECTRICITY.

Of late years, numerous patents have been obtained for more or less grotesque and complicated modifications in the construction of Lightning-Rods; and the patentees, in their energetic efforts to make a market for their wares, have tried to reopen certain questions which were settled long ago, and which could not now be raised, were it not that the laws of electricity, and of thunder storms, especially in their relation to the subject of protection from lightning, have been quite beyond the range of general study and education.

There is beginning to be diffused a better knowledge of the natural law involved, as the popular mind becomes familiarized with the operation of the Electric Telegraph. Public attention is not infrequently arrested by newspaper accounts of the influence of atmospheric electricity upon the telegraph-wires, and the occasional prevalence of "earth-currents," of sufficient uniformity to admit of being actually used to transmit messages.

Although great advances in the science have been made since Franklin's time, the question, What is Electricity? remains unanswered; and a not uncommon result of such new discoveries as have been made has been the overthrow of preëxisting theories upon the subject. We appear to be tending toward the conclusion that what we call electricity, instead of being a substance, may be a property or condition of matter—perhaps some unexplained kind of molecular or atomic motion. Speculative inquiry in this direction, however, is less important and useful than investigation of the laws governing electricity or electrical manifestations, and the consideration of observed facts concerning which there is no disagreement.

The most important law of electricity is, that it seeks what is called a state of equilibrium; that is, if we consider it a single fluid, that it tends to diffusion in equal proportions throughout all matter; or, if we choose to adopt the theory of the existence of two distinct fluids, then that these two fluids tend to unite in equal proportions everywhere. When electricity is so diffused, or (if there be two fluids) when they are so united, no electrical effects are observable, and there is then a state of rest or equilibrium. But this state of rest is constantly disturbed by the operations of nature—by evaporation, changes in temperature, friction, motion of all kinds, even the movement of our bodies; and currents of electricity are immediately set in motion to neutralize the disturbance. These currents may be of such

low tension as to admit of detection only by the aid of the most delicate apparatus; or they may be developed with such spasmodic irregularity and force as to interfere with the use of the telegraph; or, again, with such constancy of direction and tension as to be made use of in sending messages on the wires. Finally, in a state of extreme tension, they exhibit themselves to us in the form of explosions or discharges of lightning.

We may familiarly illustrate the idea of these currents of varying tension by reference to the spectacle of a tea-kettle or boiler filled with water, which, when first placed on the fire, sends forth from an opening gentle clouds of vapor. As the heat increases, the steam rushes out with a spiteful hiss; and finally, when it has acquired sufficient tension, if the means of escape are inadequate, it bursts the boiler with a violent explosion. So electricity flows in currents of more or less tension, according to the degree or extent to which its equilibrium is disturbed, and manifests its greatest known tensional force in the form of a discharge of lightning. The discharge or explosion being the consequence either of interruption in the flow of currents of low tension, or of an immediate and extensive evolution of electricity; in other words, a sudden and extreme disturbance of the equilibrium.

Hence the insulation of lightning-rods is not only an absurdity—as indeed Dr. Franklin perceived a hundred years ago, when it was first suggested—but it is also a grave error; because the insulators, to some extent, arrest the flow of currents of rarified electricity, which it is the true function of the lightning-rod to facilitate. On the other hand, the insulator amounts to nothing as a barrier against a discharge of lightning, which can either pass through it or leap the short distance between the rod and the building. The prejudice in favor of insulators arises from a misapprehension. Strictly speaking, there are no non-conductors; but that term is applied to substances which conduct very imperfectly and are subjected to violent disruptive effects when a shock of electricity passes through them.

The insulation of telegraph-wires is frequently referred to by lightning-rod men as exhibiting the necessity and usefulness of insulating lightning-rods; but the cases are not at all parallel. Currents of electricity of low tension are used for telegraphing; and whenever a discharge of lightning strikes the wires, it breaks the insulators and passes down the poles to the earth, as the frequently splintered telegraph-poles bear witness. The object of insulating telegraph-wires is to *postpone* the restoring of the equilibrium, by preventing the electric currents from taking the shortest course from pole to pole of the battery; whereas the purpose of a lightning-rod is to *promote* the restoration of the equilibrium as rapidly as possible. If the rod be insulated, the "non-conducting" substance between the rod and building intercepts and stops the flow of currents of rarified electricity from the building to the rod, and thence to the atmosphere, and vice versa, thus permitting a continued disturbance of the equilibrium of the building, under the influence of a "thunder-cloud," until a discharge of lightning takes place. Then the fluid has sufficient force or tension to overcome the obstacle which the insulators present, and an explosion into or from the building is the necessary consequence. Of course, the quantity of electricity required to restore the equilibrium of the building is small compared with the whole discharge, which may come from a cloud thousands of acres in extent; but it is enough to do injury if it comes all at once and in a high state of tension. To insulate the lightning-

rods, therefore, is to fasten the safe-valve and render it inoperative.

To prevent a discharge from leaving the rod and passing through the building, something more must be done than to attempt to keep it out by erecting such a flimsy and insignificant barrier. The rod must be arranged so as to present points for the reception and discharge of electricity at the extremities of the building, both above and below, and the different terminations in the ground must be connected by rods lying across the roof, so that lightning can be provided with a path in a horizontal direction, which, being continuous, will be preferred to any series of detached masses of conducting matter contained within the building.

In construction and application, lightning-rods should be simple, substantial, and durable, and any metal is a sufficiently good conductor for the purpose. The difference in the conducting power of iron and water, which ranks next to the metals as a conductor, is, according to Cavendish, as millions to unity. The relative conducting power of different metals is, therefore, not worth considering in this connection; hence iron is used for the telegraph instead of copper, which is theoretically a better conductor than iron. A lightning rod made of the precious metals (which are the best conductors) would not be effective if it were improperly located and arranged. If a rod of any metal be rightly constructed and judiciously applied, there is no danger of a discharge of lightning leaving it for any less perfect conductor within the building, and it is only those substances which are poorer conductors than the metals that are injured by the passage of electricity upon them.

To be hypercritical, iron may be said to be the best metal for lightning-rods, because the rusting of its surface, which does not materially impair its conducting power, produces numerous sharp points, which to receive or disperse electricity as may be required. Every one can understand why the upper extremity of a rod is pointed, and on reflection should easily perceive the usefulness of other points at intervals along the line of the rod. If it were true that a lightning-rod should have a perfectly smooth surface, it would obviously be equally true that it should be surmounted with a globe or ball instead of a point. The function of the points on a lightning-rod is to increase its capacity to receive or disperse rarified electricity when the locality is in a state of electrical activity, owing to the prevalence of a thunder-storm.

The operation of the points is substantially the same whether the currents of electricity are flowing from the earth, the atmosphere and clouds, or *vice versa*; and these currents tend to circulate with the greatest rapidity and intensity just previous to a discharge of lightning. The lightning-rod, therefore, should have an intimate connection with all matter in the vicinity, and be so contrived as to have the greatest attainable capacity to promote and facilitate the circulation of rarified electricity, so as, if possible, to forestall the discharge by restoring the equilibrium silently.

THE receipts on the Western and Brazilian Telegraph, for the four weeks ending January 29, have been £10,566.

PURE glycerin may be tested as follows: When treated slowly with sulphuric acid, it should not turn brown; with nitric acid and nitrate of silver, it should become cloudy; and when rubbed between the fingers it does not emit a fatty smell.

## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

In the JOURNAL of Nov. 2d, 1874, appears an article headed "Responsibility upon Collect Messages."

The last clause of this article says: "Answers to paid messages are not entitled to be taken collect, except when they are prepaid at the office of origin." Rule 11, Book of Rules, makes an exception in favor of answers to paid messages, allowing them to be sent collect; and in view of the fact that this rule still remains upon Blank Form 53, which is attached to "Uncollect Messages," returned to offices by the Auditor for collection, the question presents itself whether that portion of Rule 11, referring to "Answers to Paid Messages," is superseded by the clause referred to in the JOURNAL, and unless managers are definitely informed upon this point, it will afford them an opportunity to evade settlement of "Uncollectible Messages," returned as above for collection. It would seem necessary to either announce the fact that Rule 11, or that portion of it, is now void, and have new Forms 53 printed.

Another matter in this connection now stands in an indefinite position, i. e., guarantees for answers as required under Rules 11 and 12. The question presents itself as to how long a guarantee should be held, and how long the manager is supposed to be responsible for a verbal guarantee, as it frequently happens that a deposit is refunded to parties, after having been held for a time—in judgment of the manager—sufficient to procure an answer, or if the customer is transient it is retained until he is compelled to depart, and after the money has been refunded, if the answer comes, it has been customary to return the message as uncollectible. In very few instances is collection ever made upon such messages, and it may be readily set down as an outright loss to the Company. The sender of an answer usually has no interest in the matter, acting in the capacity by way of accommodation, and frequently doing so for comparative strangers, consequently he would refuse to prepay the same, or pay it when returned as an uncollectible, while the manager at the office from which answer is sent would evidently have performed his duty in accepting and forwarding the answer collect, and should not be held responsible for the amount, in case of failure to collect at destination; but is the manager of office at point of destination free of all liability? Is not his judgment liable to be questioned, and if found defective, how is adjustment to be made? This of course refers only to messages which plainly ask for an answer, and it is fully understood that a deposit for reply has been made. When no request is made for an answer, it is now understood that answers must be prepaid or guaranteed; and here comes the question of responsibility, in case of failure by managers at receiving office to report failure to collect to the originating office.

Rule 77 requires that notices shall be sent both by wire and mail; but it is frequently claimed that neither notice is received, consequently collection is never made, or if received, are too late for collection to be made. This would seem to indicate that managers should be required to notify originating offices within a limited time, and any failure on their part should render them liable for the amount. It would seem impossible that both notices, by mail and wire, should be lost; and managers at point of origin can substantiate their claim upon inquiry for copy at repeating offices, to ascertain if it passed there.

Of course if a rule was made prohibiting answers

from being sent collect at the Company's risk, it would obviate the necessity of any farther instructions; but if the guarantee system is allowed to remain in practice there will be continual losses to the Company from this source, besides permitting evasions from responsibility on part of Managers. It would seem as though a system could be devised to reduce the amount of loss which the Company is compelled to suffer, if not to prevent any loss whatever; and I make the following suggestion for consideration, or to invite expressions from other sources which may lead to some good results. If a party at 'A' sends a message to a party at 'B,' requiring an answer, he should be required to deposit an amount sufficient to cover the tolls for a ten word message between points A and B. A limited number of hours should be established in which to procure answers, and the party at 'B' should be notified of this when message is delivered. Should he find it impossible to reply inside of the limit, distinctly stating the fact at the time, or failing to present answer, the manager at 'B' should notify party at 'A' by a brief message stating why no answer is given, and manager at 'A' will then refund one-half the amount deposited for the reply.

This 'Office Message' should be checked collect and 'B' office checks 'A'  $\frac{1}{2}$  the 10 work rate for same, 'A' office accounting for the amount accordingly. Any failure on part of manager at 'B' to give the matter his attention should render him liable for the loss ( $\frac{1}{2}$  the tolls) which would go far toward securing promptness in such cases—one means of preventing losses to the Company. An answer should not be sent, unless prepaid, after the limit has expired or notice sent. This plan would be adaptable only between points at no great distance apart, and the limit for replies should be made different to correspond with the distances.

This might require a graduating scale up to a certain distance, and above that distance between points all messages should be prepaid.

C. A. C.

St. LOUIS, Mo., Jan. 26th, 1875.

To the Editor of the Journal of the Telegraph:

Do the telegraph lines in Europe, Asia, Africa and South America use the same characters, or Morse letters, in transmitting messages that we do here in the United States?

If not, what is the difference in the characters?

Are the same characters used on all cable wires?

Please answer in next issue of JOURNAL, and oblige  
AN OPERATOR.

Answer.—Nearly the same. See JOURNAL of April 1st, 1873.

DAYTON, Feb. 7, 1875.

To the Editor of the Journal of the Telegraph:

In looking over the JOURNAL of the 15th December, 1874, in an obituary notice of the late Ezra Cornell, you say "Morse, Vail, Gale, Kendall, Cornell, the inventor, and his aids, are all dead."

Allow me to make a correction in stating that Mr. Leonard T. Gale is still living, and a resident of Washington, D. C.

JOHN HORN.

## BALTIMORE AND OHIO TELEGRAPH LINES.

Mr. Robert Stewart has been appointed General Superintendent of Telegraph of the Baltimore and Ohio Railroad, in place of Mr. A. G. Davis, who has resigned. Mr. Stewart has been Superintendent of Telegraph of the United Railroads of New Jersey Division of the Pennsylvania Railroad since the lease, and was for many years previously connected with the New Jersey lines.

## CONSUMPTION OF ZINC IN BATTERIES.

Dr. P. H. Van Der Weyde, of this city, made a number of special experiments for the purpose of determining whether the consumption of zinc in a galvanic battery is greater when the circuit is continually opened and closed through an electro-magnet, than when it remains permanently closed with the same amount of resistance in circuit. He found that the consumption of zinc is the same when the current is permanently closed, whether the electro-magnet is made to sustain a weight or not. It, however, the current is often interrupted by breaking the contact rapidly, as in the case of electro-magnetic engines, induction coils, etc., the consumption of zinc increases by the action of the induced or reflex currents generated at every break of contact, and which acts most injuriously on the battery. It is well known that an induction coil, with its continuous contact breaker, wears the battery out very rapidly by reason of those induced or reflex currents, the power of which depends upon the size of the electro-magnets. In telegraphing, the electro-motive force is principally consumed to overcome the resistance in straight wires, while the coils of the magnets form a comparatively small portion of the circuit; therefore the induced currents in this case do not practically amount to much. Therefore telegraph batteries last much longer in proportion than those employed for induction coils, electro-magnetic engines, or in general for charging intermittently large powerful electro-magnetic coils. As the forcible removal and replacement of the armature from and to a charged electro-magnet also induces secondary currents in the coils, which react on the battery, such removals and replacements, when continually repeated for a time will—withstanding the battery current remains permanently closed—cause a certain increase in the consumption of zinc.

THE SPECTRUM OF THE AURORA BOREALIS.—The late Prof. Augstrom, who at no time accepted the theory that the spectra of gases varied with the pressure and temperature and chemical process, advanced the opinion that the spectrum of the Aurora Borealis is composed of two different superposed spectra, the one consisting of extremely feeble bands of light, belonging to the spectrum of the negative pole, the other consisting of a single strong yellow hue, which is characteristic of the Aurora, and which Augstrom believed, owes its origin to fluorescence or phosphorescence.

OBSERVATIONS ON A RECENT COMMUNICATION BY M. VOLPICELLI ON THE ELECTRIC INFLUENCE.—M. E. Blavier.—In the *Comptes Rendus* for November 16 appears a note on electric influence, in which M. Volpicelli cites several experiments, the results of which appear to him opposed to the received theory. The author maintains that the facts in question are perfectly conformable to the theory as established by M. G. Green in 1828, and expounded in the "Theorie Mécanique de la Chaleur" of Briot. Two conductors, placed in connection by means of a metallic wire, assume the same potential or the same tension, and the positive fluid passes from the conductor whose potential is highest to the other. On the other hand, a conductor placed in the neighborhood of a body positively electrified takes a positive potential. If the latter is connected to an electrometer whose potential has been brought to zero by a momentary communication with the earth, it loses a part of its positive fluid, which passes into the electrometer, and imparts to it a positive potential evinced by the separation of the movable leaves. This is the case of M. Volpicelli's second experiment.

## EASTERN TELEGRAPH COMPANY.

The fifth half-yearly general meeting of the shareholders of this Company was held lately at the City Terminus Hotel, Cannon street, London; Mr. John Pender, M.P., the Chairman, presiding.

The Chairman, in moving the adoption of the report, said it would be seen from that document that they had at last succeeded in getting a direct line through France. The Company would now have exclusive use of another reliable route to Egypt and the East. The report also called attention to the retirement from the Board of Sir George Elliot. Perhaps no living man done so much to bring submarine telegraphy before the public as a property, and the Board regretted the retirement of Sir George from active participation in the business of the Company. He (the Chairman) would now refer a little to what had been done during the past half year, and also remark on what he dare say they would call the extraordinary expenses incurred during the half year. (Hear, hear.) The revenue was less by something like £2,000, but he thought they would bear him out in saying that the cause was traceable to the badness of the India trade, a matter of notoriety. Very few people connected with that trade could say they were richer to-day than they were twelve months ago. The Company, as communicators, were, of course, more or less sharers in the depression. Upon the Eastern system the loss had been £10,000, but he was glad to say this had been made up by their other interests in the Mediterranean, Australia, &c., within £2,000. Trade had been so bad as to put merchants to the shift to see how far they could reduce the cost of telegrams. When trade was good they did not spare their words, but now they put as much in half a dozen words as they used to put into twenty. With a return of better trade the traffic must increase. He believed that telegraphy must grow, and that it could not go back for any length of time. Speaking of the Egyptian traffic, he said that in consequence of the change from twenty words to ten they had fallen off a little in their traffic, notwithstanding the opening of the Levant line, but that would arise in some measure from the Russian and Turkish traffic, which used to pass over that line, now passing over the main line. As to the extraordinary expenses, they were the result of heavy charges necessitated by the carrying out of certain repairs. As to the investment of the reserve fund, they had invested £70,000 in such securities as could be turned at once into money. (Hear, hear.) There was threatened competition in the market on the part of persons whose object, he supposed, was to make money. The Eastern Company need have no fear of this competition. The competing party had got concessions from the French Government similar to their own, and were now endeavoring to raise money by syndicate for the purpose of laying a line to Egypt. Gentlemen were going into the speculation with the belief that the figured estimates were correct. He (the chairman) was prepared to show that if the proposed cable were laid, and they got half the traffic at the proposed rates, the result would barely pay working expenses, and he was afraid that those who had found the money would have to stand out of their dividends for many years to come, though the Eastern Company might benefit by it and get the duplicate line into their own hands at a low price. The system of competition was likely to injure submarine telegraphy. At the present moment there were only twenty-three messages a day to Australia, and if this number were divided, it was very easy to see that there would not be much profit for

those who put their hand to it. It might be asked how things went on at all. The fact was there were five telegraph construction companies, and they must all live, if they could, and if they could only get a contract, that was all they wanted. It was a fact that these five companies could in twelve months duplicate every submarine cable, so it could be understood how greedy they were. He advised people, when schemes came before them for duplicating existing lines, to look well into those schemes before putting any money into them. With regard to the Indian-European, the Company was on terms of friendly competition, and beyond a working connection, it was not likely anything would be done.

Sir Charles Wingfield seconded the adoption of the report.

Mr. Stewart, Mr. Finlay, Mr. Hayward and Mr. Abbot made some brief comments on the report, to which

The Chairman replied that, in reference to bad cables, the Company's cables were made by the Telegraph Construction Company, and he believed they had given the Company the best that they could make. They had suffered most from the Lisbon cables. They had laid to Government charts, believing implicitly in the soundings, but it had so turned out that they were fallacious, and the cables lay in a position in which they could not live for any length of time. They had now been removed into sounder ground. Upon the subject of submarine telegraphy generally he would repeat what he had always told them, that it was more or less a speculative investment. If any of the proprietors would come to the office he would show by figures that he was quite justified when he had made a statement as to the paying of 8 per cent. He was prepared at any time to vindicate any statement he had made. It was his opinion that every reduction of traffic would result unfavorably to the shareholders. He begged them not to deceive themselves that the expenses of managing such concerns as theirs could be very much reduced.

The report was then adopted. The re-election of the retiring Directors and Auditor followed, and a vote of thanks concluded the business.

DIRECT telegraphic communication is now established between the Bourse in Paris and London, and it is notified that all telegrams intended for the Paris Bourse should be written on the forms expressly provided for this service, which can be obtained on application at the office.

THE Central American Telegraph Company have received a telegram announcing the arrival of the steamship Hooper at Cayenne with the cables to duplicate the system of the West India and Panama Telegraph Company, and to complete the service between that port and Demerara. The cables are reported to be in perfect condition.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 23d inst. was 342,067, and during the week ended Jan. 24, 1874, when the dissolution of Parliament was announced, 324,600, showing an increase in the week of 1875 on that of 1874 of 17,467.

THE Carlists on the northern coast of Spain have again fired on steamships engaged in the telegraph cable service.

THE traffic receipts of the Eastern Extension, Australasia, and China Telegraph Company, for the month of January, 1875, were £18,924, against £20,717 for the corresponding period of 1874.

THE Eastern Telegraph Company's traffic receipts for the month of January, 1875, amounted to £37,730, and to £37,037 in the corresponding period of 1874.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 30th of January, was 339,773, and during the week ended January 31st, 1874, 368,315, showing a decrease in the week of 1875 on that of 1874 of 28,542. The unusually high number of messages for the corresponding week of 1874, was caused by the preparations for the general election.

The Faraday, screw steam telegraph ship, the property of Messrs. Siemens Brothers, telegraph engineers, of Charlton, near Woolwich, has again pirouetted, or come up the river from Gravesend, where she has been lying since her return from the Atlantic, and she has been docked in the Thames to undergo the necessary repairs, instead of going to the North, as was at first understood to be intended.

ACTION OF AN ELECTRO-MAGNET ON THE SPECTRA OF RAREFIED GASES TRAVERSED BY ELECTRIC DISCHARGES.—*M. J. Chautard*.—This paper treats of the action which powerful magnets produce in the spectra of rarefied gases traversed by the discharge of an induction coil or of a Holtz machine. These spectra, characteristic of the matter through which the spark passes, offer, under the influence of the magnet, peculiarities very striking and special as regards number, position, intervals, and the degree of fineness of their lines. The experiments have as yet been confined to the spectra of the non-metallic bodies, taking for types the elements pointed out by M. G. Salet in the important research which he has published on this subject. Each body was enclosed in a Geissler's tube, having one part contracted and almost linear, which was placed between the poles of an electro-magnet and at a small distance from the slit of a spectroscopic. The divisions of the micrometer, previously marked upon the Fraunhofer lines, enables us immediately to convert the corresponding colors of the spectrum into the lengths of undulators. Finally, another Geissler tube quite analogous to the former, placed in view of the small reflecting prism, and outside the action of the magnet, gave a second spectrum in juxtaposition to the first so as to serve for comparison. A spark was then passed through both tubes, and the perfect agreement of the lines given by each spectrum was ascertained. This agreement ceases the moment that the magnet is set in action. Whilst one of the spectra preserves its primitive character, that yielded by the gaseous matter exposed to the influence of the magnet undergoes remarkable changes, which in case of each body present new appearances, according as the intensity and the direction of the current, and the distance of the magnet. The bodies experimented upon are hydrogen, chlorine, bromine, iodine, oxygen, sulphur, selenium, and nitrogen. The light of selenium and of sulphur under the influence of the magnet is notably diminished in intensity, so that the spectrum, very feeble at first, disappears after the lapse of a few instants. Chlorine and bromine are characterized by an increase of lustre, and by the development of fine, brilliant, numerous, lines, especially in the green, the appearance or disappearance of which, on turning the interrupter, produces a perfectly magical effect. These phenomena may have a certain importance, both as regards celestial spectroscopy, and as regards the obscure relations of magnetism and light.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, March 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Weston, Ill., closed.  
Roann, Ind., reopened, square 261.  
Aurelia, Iowa, reopened.  
Carlisle, Ky., reopened, square 222.  
Olney, Md., closed.  
Squan, N. J., closed. Business will, until further notice, be mailed from Freshhold.  
Woodbridge, N. J., reopened, square 41, check direct.  
Bedford Station, N. Y., closed.  
Amityville, Islip, Oakdale, Patchogue and Sayville, L. I., are now W. U. Offices, all in square 32, check direct.  
Newry, Ont., reopened.  
Selin's Grove, Pa., reopened.  
Messages for Angora, Pa., (formerly a W. U. Office, closed Dec. 1, 1874,) will be delivered by the Phila. Local Tel. Co. Charges 85 and 1 in addition to the Philadelphia rate.  
Hereafter the "tariff for other lines" to Broadway, Va., via Alexandria, will be 60 and 4.

## NEW OFFICES.

312 Leighton, Ala.  
• Bodega, Cal., 100 8 Petaluma.  
Oakdale, Cal.  
• Sulphur Creek, Colusa Co., Cal., 50 25 Colusa.  
598 Slaghta, Col.  
20 East Hampton, Conn.  
196 Tennille, Ga.  
347 Green Valley, Ill.  
202 Fishers, Ind.  
271 Sharpsville, Ind.  
467 Liberty, Ka.  
21 Malden, Mass.  
368 Morton's, Miss.  
41 Deans, N. J., check New Brunswick.  
47 Harlingen, N. J., check Lambertville.  
47 Hillsboro, N. J., " "  
47 Hopewell, N. J., " "  
41 Mountain Station, N. J. P. O. So. Orange.  
38 College Point, L. I., N. Y.  
33 Freeport, " "  
33 Garden City, " "  
33 Hempstead, " "  
33 Merrick, " "  
33 Pearsall's Corner, L. I., N. Y.  
33 Rockaway, " "  
33 Rockville Centre, " "  
33 South Oyster Bay, " "  
33 Valley Stream, " "  
33 Whitestone, " "  
33 Woodside, " "  
• Georgiaville, R. I., 25 2 25 Providence.  
• Kingsley Sta., Que.  
• Hudson, Que.  
• Point au Chene, Que.  
469 East Bernard, Texas.  
Dry Canon, Utah, (W. U. Office.)  
30 South Barton, Vt.

Messages and communications for Union Stock Yards, Ill., are by some managers erroneously addressed to Union Stock Yards, Chicago. They should be addressed simply, Union Stock Yards, Ill.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, February 25, 1875.

On March 15th, Bowling Green, Ky., will be added to the list of money order offices in J. B. Tree's district.

GEO. H. MUMFORD, Vice Pres't.

EXECUTIVE OFFICE,  
New York, March 1, 1875.

## Executive Order No. 160.

The lines and offices on the Northern R. R. of New Jersey, from Jersey City to Nyack, including the latter office, heretofore included in the First District, Eastern Division, are hereby transferred to the Ninth District, Central Division.

WILLIAM ORTON, President.

EXECUTIVE OFFICE,  
New York, March 1, 1875.

## Executive Order No. 161.

On and after March 1, 1875, half-rate messages may be sent "collect" on the guaranty of responsible customers, the same as before the issue of Order No. 152, which, so far as inconsistent herewith, is hereby revoked.

WILLIAM ORTON, President.

## DOMINION TELEGRAPH COMPANY.

## ANNUAL MEETING.

The annual meeting of the Dominion Telegraph Company was held at noon on Wednesday, the 10th day of February, 1875, in the head offices of the Company, Toronto, Canada.

The President's report shows a general increase of business. During the past year 517 miles of pole line, and 1,239 miles of wire have been added to the plant. These additions bring the total mile poleage to 8,102 miles, with 5,807 miles of wire and 305 offices. The Directors asked for authority to issue new stock to the amount of \$100,000 for the purpose of further extension. This authority was granted.

Hon John McMurrich was re-elected President; John J. MacKenzie, Vice-President, and James Mische, Treasurer.

THE AMERICAN DISTRICT COMPANY, OF  
SAN FRANCISCO.

The American District Telegraph Company, of San Francisco, through its President, Mr. George S. Ladd, has made a proposition to the Board of Supervisors to take charge of the Fire Alarm Telegraph of that city, and to connect it with the District System. The proposition appears to be that the city should appoint and pay the employees specially required for the Fire Alarm Telegraph service, but that the District Company should take charge of the lines and apparatus and maintain them, returning them at any time they should be required to do so to the old quarters, without cost to the city.

At the last advices the matter was still under consideration.

THE GOLD AND STOCK TELEGRAPH  
COMPANY.

The difficulties and litigation which have existed between the Gold and Stock Telegraph Company and the Manhattan Quotation Telegraph Company have been adjusted, and a working arrangement has been completed between the two companies in their mutual interests.

From the first of March the charge of the Gold and Stock Company to brokers and others furnished with quotations will be increased from \$10 to \$20 per month. Previous to the competition between the two companies the charge was \$6 per week. Twenty dollars per month is regarded as a reasonable price for the service rendered, and as cheaply as any company can afford to do the business in a satisfactory and effectual manner.

MORE TELEGRAPHIC FACILITIES FOR  
NEW YORK.

The Western Union Telegraph Company have extended the facilities for business on the West Side by making a delivery office of the office in the Butter and Cheese Exchange. The Exchange is also provided with the reporting instruments of the Gold and Stock Telegraph Company, and there is a private line from the Exchange to lower Wall street, over which information relative to sugar, teas and other groceries is constantly obtained.

ON THE CONDUCTIBILITY OF INDIFFERENTLY CONDUCTING BODIES.—By the Count du Moncel.—A short paper, in which the author examines the conducting power of tissues, which being more or less hygrometric, should furnish very varying conductivity effects, not only in proportion to the damp state of the atmosphere, but also according to hourly temperature of the day and night. Silks and wools gave far from expected results, for at a relatively low degree of moisture the conductivity of the wools was less than that of the silks. M. du Moncel found invariably that black silk gave very large galvanometer readings, whilst other colored silks scarcely gave any deflection; those that gave the least readings also, curiously enough, cost a higher figure. The conclusions deduced from the experiments are—that, contrary to the general accepted opinion, the silk stuffs reputed to be insulators are a long way from being so, and that during a period relatively dry woollen stuffs are more generally insulators than silk stuffs—at least for voltaic currents. Color does not seem to have any well-marked action upon wools. On inquiry into the manufacture of black silk, in order to discover the cause of its greater conductivity over other colors, it appears that manufacturers impregnate it with a large quantity of iron and tannin: hence the reason, liquids being much better conductors according as they contain saline materials in solution. And this process is precisely what takes place in the substance of the black silk, through its becoming impregnated with moisture on account of its hygrometric property. Linens most readily absorb atmospheric moisture, and give greatest deflections the greater its coarseness. Cotton goods are likewise large conductors, but to a less degree; the coarser the texture the better the conductivity. The galvanometer indications are so exact for these different sorts of "stuffs" that it is possible to detect the presence of either cotton or thread in silk or woollen materials. The effects of polarization are less than with minerals, and from carefully-repeated experiments the following conditions were arrived at:—For a certain direction of the battery current the effects of polarization gave place to an increase of that current, and that for the contrary direction they determined a considerable and rapid fall.

## BORN.

BORDEN.—At Bridgeton, N. J., Feb. 23, 1875, a son to James Y. Borden, Manager W. U. Tel. Office.

COLLINS.—In New York, Feb. 21, 1875, a daughter to P. Collins, Manager W. U. Tel. Office, Allertons (N. Y. City).

HOWIE.—At Pawamo, Mich., Jan. 26, 1875, a daughter to D. M. Howie, Agent and Operator.

## MARRIED.

GORDON—BILLINGSLEY.—On Jan. 20, 1875, by Rev. W. J. Jones, at the residence of the bride's father, Mr. J. H. Gordon, Agent and Operator H. and T. C. Ry., at Elgin, Texas, to Miss Lee Billingsley, of McDade, Texas.

LEDNUM—TOWNSEND.—At Townsend, Del., Feb. 11, 1875, by Rev. Dr. Crowell, W. S. Lednum, Manager W. U. Tel. Office, to Miss Laura Townsend, all of Newcastle Co.

## CONSIDERATIONS IN FAVOR OF DR. FRANKLIN'S THEORY OF ELECTRICITY.

BY EDWARD E. QUIMBY.

Electricity is known only by its effects; its operations are seen to be uniformly governed by certain fixed laws, concerning the nature of which the scientific world is substantially agreed; but what it is, whether a substance or an abstract force, is still a matter of pure speculation.

Dr. Miller shrewdly observes in this connection, that if we deem it essential to assume the existence of an electric fluid to account for electrical phenomena, we may almost as well assume the existence of a gravitative fluid to account for the attraction of cohesion. It must be admitted that the results of general scientific research, strongly indicating the correlation of all forces in nature, powerfully support the inference that electricity is a property or condition of matter rather than matter itself.

But as the question is of comparatively little practical importance, the theory of electricity being merely the hypothetical framework, so to speak, for arraying the known facts, there seems to be no adequate reason why we may not select that hypothesis which furnishes us the most simple and convenient terms for reciting and describing those electrical phenomena, the knowledge of which constitutes the sum of our positive information upon the subject.

Franklin supposed electricity to be a substance, a subtle fluid, having an attraction for, being attracted by and pervading all terrestrial matter, manifesting its effects only when disproportionately diffused in adjacent bodies. He considered electrical conditions as plus and minus, and described them respectively by the terms "positive" and "negative" as applied to bodies in a state of electrical activity.

The Franklinian theory being thought to involve the necessity of assuming the existence of a repulsive force between negative bodies—that is, bodies minus their proportion of electricity—was rejected in favor of the idea of M. Dufay and others, that there were two distinct fluids, manifesting themselves when separated and tending to unite in equal proportions.

Although both these hypothesis are now generally discarded, and what we call electricity is assumed to be some sort of vibratory force affecting the particles of matter, we do not feel that full justice has been done to Franklin's opinion; and it is certainly true that the objection to it above alluded to was strained and superficial.

The central idea of the Franklinian theory is, that a mutual attraction exists between electricity and all other matter; when matter is uniformly saturated with electricity, or, in other words, when the fluid is equally diffused, this attraction is balanced in all directions, and hence electricity is quiescent, producing no apparent effects. When this state—the equilibrium, as it is called—is disturbed, the balance of attraction is destroyed, and light bodies are set in motion in the direction of the greatest attraction. If they are deficient in electricity they move towards the nearest supply; if they contain an excess they are attracted in the direction of the greatest deficiency.

Two contiguous negative bodies, while exerting no attraction for each other, are attracted by the electricity in surrounding matter, and therefore, if

they are sufficiently light, they recede from each other in obedience to the sum of the attracting forces to which they are respectively subjected. They may be made to move in the same direction by approaching the hand or some other substance, which, being a better conductor than the air surrounding them, and being connected with the earth, will more readily furnish the supply of electricity which they seek. Each of the two negative bodies constitutes or establishes as it were, with respect to the other, an electrical vacuum, and as they both require a supply of electricity they of course separate in opposite directions, unless we modify their situation by presenting a superior source of supply at some one point, when, as before remarked, they move toward that in obedience to what is obviously the greater attraction in that direction.

Two light positive bodies separate because, being equally oversaturated, the excess of electricity which they severally contain carries them with it in its effort to impart itself to surrounding matter. The force, which operating in this way, causes electricity to tend to an equal distribution, might be called, if we were permitted to coin a term in familiar language, attraction of equilibrium. The attainment of a quiescent state, however, does not imply any cessation of this force, but merely uniform diffusion; and therefore perfectly equal attraction in all directions.

One operation of attraction of equilibrium, if we may use this phraseology, has been heretofore explained by what was called the "Law of Induction," the latter term having been adopted because it was observed that electrified bodies induced an electrical state contrary to their own in the nearer parts of adjacent bodies from which they were separated by an imperfect conductor, such as dry air, for example. "Induction" is a convenient and expressive designation for these and similar phenomena; but instead of considering it as a law, it is rather to be regarded as an incidental operation of the general law of mutual attraction between electricity and matter.

It is impossible to conceive the existence of a force without any material substance upon which it operates in manifesting its existence to our senses; and the suggested analogy between electricity and several of the other physical forces seems to fail when we come to consider the phenomena of "induction."

The force of electrical attraction, which increases very rapidly as objects unequally electrified approach each other, appears to extend indefinitely, and is supposed to diminish in intensity inversely as the square of the distance.

An electrified body induces activity in neighboring bodies, without contact or communication, by altering the balance of forces which determined the distribution of their electricity previous to its approach.

If the electrified body be negative, it presents, as it were, a vacuum, which strongly attracts the electricity of adjacent bodies. As the negative body continues to approach, this attraction increases in intensity, and the fluid collects at the nearest point of the adjacent object, until finally the resistance of the intervening air is overcome by an explosion of the quantity of electricity required to fill the vacuum and bring it up to a state of equal saturation with surrounding bodies.

If the electrified body be positive, this state of things is reversed; the electricity of adjacent bodies, previously sustained by an equal attraction in all directions, is released from attraction in the direction of the body containing the excess, and recedes

under the influence of the remaining attractive forces.

If all matter conducted electricity freely we should never witness these phenomena; but glass and a number of other substances, including dry air, oppose so much resistance to the passage of electricity, that they are relatively denominated non-conductors.

Supporting an object upon a non-conductor, which is called insulating it, enables us to alter its electrical condition and observe the influence of induction, or attraction of equilibrium, as we prefer to say.

Insulated cylinders of metal are best for such observations, because electricity moves freely upon metals, and so yields quickly to any modification of the forces which regulate its distribution.

When electricity is induced in a long insulated conducting body, the two ends exhibit opposite electrical conditions, and if it be then divided in the middle and separated, the two separated portions will be found to be respectively plus and minus; one portion having giving up its electricity to the other. If we then remove the two portions beyond the influence of the inducing electric, the cause of the original disturbance, and bring them together, a spark will pass between them, and the equilibrium of both will be found to have been thereby restored.

This electrical disturbance in an object, developed by the mere proximity of an electrified body with which it is not in contact or communication, continues until the two bodies are either separated, or brought sufficiently near together for an explosion or discharge of electricity from one to the other, distributing equally the fluid which was before disproportionately divided between them.

The Franklinian theory that electrical manifestations proceed from the transpositions of a material substance of exceedingly subtle and ethereal character, furnishes so apparently consistent an explanation of these phenomena of static electricity, and such simple language for describing them, that we prefer to adopt it. Franklin's terms, positive and negative, so aptly expressive of his conception of electrical conditions, continue to be used, although the scientific world has long since discarded his theory. The presumptuousness of still adhering to it is somewhat lessened by the following noteworthy circumstance:

At the meeting of the British Association for the Advancement of Science at Swansea, a discussion arose on the nature of electricity, and Dr. Faraday was called on to give his opinion. He then said, "There was a time when I thought I knew something about the matter; but the longer I live, and the more carefully I study the subject, the more convinced I am of my total ignorance of the nature of electricity." As Bakewell (*Manual of Electricity*, page 186) justly remarks: "After such an avowal from the most eminent electrician of the age, it is almost useless to say that any terms which seem to designate the nature of electricity are merely to be considered as convenient conventional expressions."

Finally, Matteucci and other adherents of the modern vibratory theory of electricity and the correlation of physical forces, assume that there exists throughout the universe what they call a "diffused ether," the different movements of which exhibit electrical, magnetic, nervous and other phenomena. The difference between this and Franklin's idea of the "diffused ether," which he called electricity, seems to be mainly as to the character of the movements in question.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

183 Broadway, New York.

NEW YORK, MARCH 1, 1875.

### REDUCTION IN CABLE RATES.

The President of the Western Union Telegraph Company has received the following telegram from the London manager of the Anglo-American Cable Company:

"On and after the 1st of May, 1875, the tariff from New York to the United Kingdom and France will be reduced to fifty cents per word, gold. This company's word system of charging messages will be extended to the Continent of Europe and to all other countries, so far as this company's rates are concerned."

THE Western Union Company has leased the wires of the Flushing, North Shore and Central Railroad Company, and also those of the Southern Railroad Company of Long Island.

THE Fifth District of the Southern Division of the Western Union Company's lines has been consolidated with the Fourth. The consolidated districts are placed under the superintendency of Mr. C. G. Merriwether. Mr. D. Flanery, who has thus been relieved from the charge of the Fifth District, has been appointed Chief of Construction of the Southern Division.

FAILING to secure the required number of votes in the Senate to adopt his scheme for Postal Telegraphs, Senator Dorsey endeavored to tack it on as an amendment to the Post Office Appropriation Bill, but with no better success.

### THE POSTAL TREATY WITH CANADA.

The postal treaty between the United States and the Dominion of Canada, which was negotiated in the latter part of last year, went into effect on the 1st of January. Under its provisions letters can be sent from any part of this country to any part of the Dominion for three cents. The one cent postal card does not require an additional stamp if directed to Canada. Newspapers require a one cent stamp only, but all postages must be fully prepaid. So far as postal arrangements are concerned the relations of the United States with the Dominion are now precisely the same as those between each State in the Union, except that, *when not fully prepaid*, letters to Canada are not forwarded.

### TELEGRAPH JOBS.

Of all the jobs which have periodically appeared with each session of Congress for the last few years, the schemes to despoil the telegraph companies, and to depreciate the value of their property, have been the most persistently urged by lobbyists and official speculators. Of course, in their efforts in this direction, these parties are wholly governed by consideration for the public welfare. No amount of exposure disturbs their equanimity, no argument or logic dashes their ardor. Their patriotism is too soaring to be affected by such trifles. The chances at the public purse are so alluring, and the apparent prospect of being able, eventually, to feather their nests at the public expense is so encouraging that job succeeds job; as soon as one scheme fails another is ready, and as fast as one set of speculators retire another set steps into the vacant places.

For the last five or six years, each session of Congress was more or less occupied with the delusive schemes of Hubbard and of Postmaster-General Creswell. The injustice to holders of private property, together with the incorrect figures bolstered up by false estimates, embraced in these projects, were so thoroughly exposed that the schemes came to naught, and the chief promoters retired from the scene.

In sympathy with the public, who are now fully acquainted with the value of this interested patriotism, we had hoped that after these two snakes had been scotched there would have been a period of rest, and that for a reasonable season vested rights would be secure without the necessity of fighting for their preservation. But it was not to be. In the present session of Congress the measure known as the McCrary bill was introduced. No sooner did this die than a company appeared, whose incorporators were in part members of Congress, and who modestly asked an appropriation of six hundred thousand dollars of the people's money to build a line of telegraph between Washington and Boston.

This concern seems to have been smothered, for we have heard nothing more of it. After this came a lull, and then Senator Dorsey, who appears to have appropriated Senator Ramsey's mantle, brings forward a little joker, which, if it becomes a law, will have the same effect upon telegraph companies, as a law compelling railroads to carry single trip passengers at the same rate charged commuters, would have upon the latter. Then Congress has an investigating committee upon the matter of the Western Union Telegraph Company refusing to transmit despatches to newspapers who do not pay for the service. Congress has the same jurisdiction in this case as it would over a grocer who refused further credit to an impecunious customer. And now, lastly, Gen. Butler fathers a bill, some of the provisions of which are simply monstrous. One of them authorizes the seizure of telegraphic despatches, thus destroying one of the most valuable elements of the telegraph, in violating its sanctity.

These bills have all been crowded in during the

past few weeks. It is a great relief to remember that the present session has but few remaining days of life, during which there is no probability of their passage. The unusual number pending at one time, and at this peculiar time, we accept as an augury, that for at least two years there is a prospect that owners of telegraph property will be permitted to rest quietly in possession of their just and inalienable rights.

### DEATH OF GENERAL MEYDAM.

It is with great regret that we have to announce the death of General Theodore Meydam, Director-General of the German Telegraphs, who died in Berlin on the 23d of January, after an illness of six weeks. General Meydam was born September 18th, 1827, at Crossen, on the Oder.

In 1845 he commenced his military career, and in 1859 was made Captain in the Engineer Corps.

In April, 1858, he was ordered to reside two years in Paris, in consideration of his other prominent acquirements, and to obtain there a perfect knowledge of the French language. He was made a Major in October, 1863, and on account of his special scientific attainments, was appointed on the General Staff. As a General Staff officer, he took part in the war against Denmark in 1864, and in 1866 against Austria. In the former war he was present at the siege of the Düppel fortifications, and in the storm of Düppel; in the latter war he took part in the battles of Trantenau, Königgratz, and Tobitschau. In March, 1867, he was directed to make himself acquainted with the telegraph service, for which purpose he was assigned to the Royal Prussian Telegraph Direction. Six months afterwards he returned to his military career, and on the 1st of July, 1868, was appointed Chief of the Engineer Division in the Royal Prussian Army, and in 1869 Acting Director-General of Telegraphs.

On the breaking out of the war between France and Germany, in 1870, he was appointed Chief of the Military Telegraph, and occupied this post during the war, when he again filled the position of Acting General Telegraph Director. In this capacity he acted as Representative and Plenipotentiary of the German Empire at the International Telegraphic Convention in 1871 with Austria, Hungary and Holland; and also at the International Telegraph Conference at Rome. On the 14th of October, 1872, he was appointed Imperial German General Telegraph Director. In July, 1874, he was raised to the rank of Brigade-Commander, and on the 27th October, 1874, to the rank of Major-General.

General Meydam was an elegant specimen of the German soldier, of dignified and courtly presence and genial and affable manner, and was a great favorite with all with whom he came in contact. The Western Union Company is under many obligations to him for his kindness and courtesy to Mr. Prescott during his visit to Germany, and especially

for his valuable services in personally explaining the systems of pneumatic tubes and underground lines, as well as the other peculiar features of the German Telegraph Department.

#### ANOTHER HEALTHY OFFICE.

There is more than one "healthy office" upon the lines of the Western Union Company, and it is very pleasant for us to know and to record the fact. We believe that most, if not all, of the offices enjoy a fair share of health, but, of course, here and there will be found one of more than the ordinary amount of vigor and strength. Such a one we found in Kansas City, Missouri, which, as it appeared, and really was, so strong and so vigorous, that we instanced it for the purpose of giving credit to the deserving, as well as to excite emulation. But now another arises, a perfect Tom Cribb, or "Benecia Boy," among telegraph offices, and the light of Kansas City, bright as it is, is somewhat paled.

The office at Quincy, Illinois, has a manager and two operators; no clerk. The business transacted is so great that the time of the manager is entirely occupied in attending upon customers, sending out messages received, entering the daily business and making the reports. From the figures received, it is evident that he can have but little time to devote to other duties. In the month of December last, which is not the busiest season at Quincy, the business handled was as follows:

Number of Messages handled.....	6,908
Reports and Specials, 186,483 words, reduced to message basis .....	6,823
<b>Total .....</b>	<b>13,725</b>
Number of Operators .....	2
Daily Average (excluding Sundays) of Messages to each Operator.....	268

Until further notice Quincy can exalt his horn. He is fairly entitled to this distinction.

#### ACCIDENT TO SUPERINTENDENT WALLICK.

We are greatly grieved to learn of a serious injury to Superintendent Wallick, of the Sixth District, Central Division, while returning recently to his home at Indianapolis. When the train arrived at Cambridge City, it stopped below the station for wood and water. Mr. Wallick supposing that he was at the depot, and desiring to see the operator, stepped from the train, and, it being quite dark, fell through a bridge a distance of 25 to 30 feet to the ice below. No one saw him fall or missed him. For nearly an hour he lay on the ice before succeeding in attracting attention. When discovered, his right leg was found broken about 4 inches above the knee, and he also sustained severe bruises about the head and face. Mr. Wallick has been carried to his own home and everything is being done to aid recovery, which we trust may be both speedy and perfect.

#### A CASE OF MISFORTUNE.

##### ADDITIONAL SUBSCRIPTIONS.

The following sums have been received at this office since the issue of the last number of the JOURNAL:

J. W. Copeland for 15 Operators N. Y. B. & M. Ry. \$15 00	B. W. H. .... \$1 00
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Through Mr. Wm. Holmes.

Sanford Hunt.... \$1 00	Employees on Phila. Local Tel. Co. .... \$33 75
N. Jameson.... 1 00	L. N. A. & C. Depot, Lafay- ette ..... 5 00
D. L. Rawlin.... 1 00	T. W. & W. De- pot, Lafayette. 4 00
Alice Zent..... 1 00	F. A. Moore.... 1 00
Miss V. Shanks.. 1 00	E. C. Green .... 1 00
J. A. Carnahan.. 1 00	Cash ..... 0 50
H. A. Felton.... 1 00	
J. L. S. Clymer.. 1 00	<b>Total \$85 75</b>
H. E. Doolittle.. 1 00	
G. G. Hadly, Supt. C. L. & C. Ry and Employees. 16 50	

Previously acknowledged..... \$329 75

**Grand total..... \$415 50**

On Tuesday, March 16th, at 5.30, P. M., a meeting of the Telegraphers of New York will be held in the Auditor's Room of the Western Union Telegraph Company, for the purpose of organizing a club for social purposes.

#### ARGUMENT OF MR. G. P. LOWREY UPON THE POSTAL TELEGRAPH BILL.

(Continued from Page 59.)

A parliamentary document entitled "Copy of the reports which have been received by the Chancellor of the Exchequer respecting the financial results of the transfer of the telegraph to the Government," ordered by the House of Commons to be printed, July 24, 1871, contains the following statement:

##### POST-OFFICE TELEGRAPHS.

Statement showing the amount expended from the commencement up to 31st March, 1871.

Schedule I. Transmission of messages.....	2434,674
Schedule II. Engineering.....	26,160
Schedule III. Pensions and other non-effective charges.....	9,661
Schedule IV. Capital expenditure.....	847,247
Schedule V. Capital (submarine cables).....	79,647

**Total expenditure..... 1,397,389**

Capital expenditure.....	926,894
Working expenses.....	470,495

**Total..... 1,397,389**

GEO. CHETWYND,

Receiver and Accountant-General.

GENERAL POST-OFFICE, June 1, 1871.

##### SCHEDULE I.—POST-OFFICE TELEGRAPHS.

##### Transmission of Messages.

Salaries and wages.....	2310,978
Stationery .....	28,794
Traveling expenses.....	15,788
Rent .....	24,021
Rates and taxes.....	3,990
Fuel and light.....	3,373
Commission paid to railway companies.....	3,260
Way leaves, pole rents, &c.....	17,187
Commission on postage stamps.....	3,495
Miscellaneous charges.....	24,788

**Total ..... 434,674**

##### SCHEDULE II.—POST-OFFICE TELEGRAPHS.

##### Engineering.

Salaries, wages, traveling and sundry expenses of the engineering staff.....	£19,678
Maintenance of plant by railway companies.....	6,482

**Total..... 26,160**

##### SCHEDULE III.—POST-OFFICE TELEGRAPHS.

Pensions and other non-effective charges.....	£9,661
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##### SCHEDULE IV.—POST-OFFICE TELEGRAPHS.

##### Expenditure on capital account.

Poles.....	£49,813
Arms.....	11,674
Galvanized iron wire.....	107,795
Gutta-percha covered wire.....	46,325
Insulators.....	31,266
Bolts.....	13,054
Brackets, saddles, roofs, guards, and nails.....	12,107
Instruments.....	46,752
Batteries.....	14,058
Pneumatic tubes and steam-engines, and apparatus connected therewith.....	13,021
Iron and earthen ware pipes and boxes .....	9,697
Tools, paint, carriage of men and horses, repairing roofs, and other miscellaneous items.	14,950

##### Payments of extensions.

To Electric and International Telegraph Company.....	58,042
To British and Irish Telegraph Company .....	18,244
To United Kingdom Telegraph Company.....	15,000
To Universal Private Telegraph Company.....	6,000
To London and Provincial Telegraph Company.	2,000
To engineering, salaries, wages, traveling, and other expenses.....	177,094
Buildings, alterations, &c.....	99,977
Preliminary instruction.....	8,421
Bonuses to learners.....	2,300
Promoting telegraph bill, office fittings, services of professional engineers, expenses of examining accounts of telegraph companies, fees to arbitrators, law expenses, gratuities for surrender of premises, remuneration of draughtsmen, date, and other stamps, &c....	89,657

**847,247**

##### SCHEDULE V.—POST-OFFICE TELEGRAPHS.

Cost of manufacture and laying of submarine cables.....	£79,647
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The Chairman will recollect that I called the attention of the Committee to this document in the discussion of Mr. Hubbard's scheme in April, 1872. As the statement which I then made in respect to the expenditures for 1871 apply equally well to those of 1872, I desire to recall your attention to it. I quote from the report of the proceedings before the House Committee on appropriations in the matter of the postal telegraph bill, April 22, 1872.

Mr. PRESCOTT. Every year we [The Western Union Telegraph Company] are compelled to replace a considerable amount of wire which has become worn out.

Mr. DICKEY. That is repair?

Mr. PRESCOTT. Yes, that is repair, although it is generally termed reconstruction. That reminds me that Mr. Scudamore places this kind of repair to construction account. In his report, dated July 12, 1871, he says:

"The analysis of our accounts for the fourteen months ending the 31st March last is not sufficiently advanced to enable us to state positively the exact proportions in which the total sum expended should be distributed between capital and revenue. Throughout the fourteen months we have constantly had large gangs of men engaged, at one and the same time, in putting in order the property which we have bought, and in constructing fresh lines, (the cost of which two operations is properly chargeable to capital,) and in ordinary maintenance work, such as the repairs of casual damage, the taking off of faults, and other work of the kind, the cost of which is properly chargeable to working expenses. We

\*This sum does not include payments made to the Electric and International Telegraph Company for extensions of the pneumatic tube system in Liverpool, Manchester, Birmingham, Glasgow, and London.



could not avoid this in the first year of our work; but our reconstructions are now nearly complete, and when our present scheme of constructions, which are also approaching completion, is finished, further constructions will no doubt be provided for by annual vote."

Mr. Scudamore has apparently yet to learn that reconstruction, like construction, is something which is never finished. A telegraph line is scarcely built before decay begins; and its reconstruction is as necessary an item to be considered and provided for as the ordinary working-expenses of the wire.

If the Western Union Company should charge its repairs to construction account, it would apparently increase the net revenue over three-quarters of a million of dollars annually.

The CHAIRMAN. Do you doubt the correctness of the report of the Chancellor of the Exchequer, that the net profits for the last year were £50,000?

Mr. PRESCOTT. I have not seen the report you allude to.

The CHAIRMAN. I refer to the statement made in a cable dispatch, some weeks ago.

Mr. PRESCOTT. I do not question the accuracy of the report of the Chancellor of the Exchequer, or of any other British official; but I think, in making up their telegraph accounts many important items which we should charge to ordinary working expenses the British post-office telegraph carries to construction account, and thus their net revenue is made to appear greater than the facts warrant. I have here Mr. Scudamore's report to the Chancellor of the Exchequer, dated June 3, 1871, which includes a statement made by George Chetwynd, Receiver and Accountant-General, showing the amount of telegraph revenue collected from the commencement up to March 31, 1871, and the expenditures for the same period. The total receipts are stated at £798,580, and the total expenditures at £1,397,389. The expenditures are divided into two classes, namely, capital expenditure, £926,894; working expenditure, £470,495.

Under the head of capital expenditure are £346,794 for poles, arms, wire, insulators, instruments, batteries, and tools, none of which items are to be found under the head of working expenses. And yet, how could a telegraph of the magnitude of the British system be worked fourteen months without requiring a heavy necessary outlay for these articles irrespective of construction?

Under the head of capital account £377,449 are also placed for engineering salaries and traveling expenses, alteration of buildings, preliminary instruction, bonuses to learners, office fittings, examining accounts of telegraph companies, law expenses, &c., none of which items appear under the head of working expenses, although just such expenses must continue to be made every year as long as the telegraph is maintained.

Now, as the items are not given, there are no means of accurately ascertaining what proportion of the £1,131,175, charged in 1872 to capital account, ought to have been charged to working expenses, but there is no reason to doubt that it is as large as for the preceding year, the accounts for the two years being apparently made out upon the same basis.

Mr. LOWREY. Thus results the amount which I mentioned at first, of £1,131,175, which is to be added to the annual expenditures of the English telegraph. The large deficit has attracted the attention of the public and the press, and led to the publication of an article in this country, which I will now read to the Committee. It is from the *New York Tribune*. In the article which I shall read this false addition to the capital account of a large portion of the regular annual expenses escaped the attention of the writer. The article is as follows:

#### FINANCIAL FAILURE OF THE BRITISH TELEGRAPH.

The financial outlook of the British telegraph under government auspices and management is anything but encouraging. For a long time it has been impossible to obtain any adequate or comprehensive statement as to what the system cost the British treasury in the outset, or what have been the annual expenditures for construction, maintenance, and working; inquiries in this direction having been generally met with the response that it was

not yet possible to separate capital from expenditure; and that, therefore, the public must be content with knowing that messages were transmitted at the rate of a shilling for twenty words, no matter whether the distance traversed was half a mile or five hundred. At last, however, we are in possession of information that enables us to discern something definite concerning the actual situation.

When the purchase and state control of the telegraph was first brought before Parliament, the estimate of cost, founded on the judgment of experts, was £2,200,000, or \$11,000,000. When the business, however, had been assumed by the state, it was found that the government had in reality bound itself to a much greater expenditure, and that the actual cost would not be less than £7,500,000, or \$37,000,000. This was about all the information that Parliament or its committees could get until Sir Lyon Playfair came in as Postmaster-General and successor of Mr. Monsell, in the last days of the Gladstone administration. This new official being of an eminently practical turn of mind, and without taking warning perhaps by the fate of his predecessor, who retired under a cloud for allowing Mr. Scudamore, the telegraph superintendent, to expend some four millions of dollars without the authority or knowledge of Parliament, determined to know accurately what there was to be known, and as the result of such determination we have before us a British treasury document, bearing date March, 1874, which brings up the account of the telegraph to the 1st of January, 1873, the latest date for which Parliament or the treasury has any exact returns—a fact in itself not a little singular and suggestive. The figures tabulated are as follows:

Capital account .....	£8,667,800 or \$43,339,000
Gross receipts, less amount paid to submarine telegraph companies .....	970,083 or 4,850,415
Expenditures in respect to salaries, rents, and maintenance .....	825,275 or 4,126,275
Balance applicable for interest and sinking fund .....	144,808 or 724,040
Annual charge for interest, January 5, 1873 .....	258,390 or 1,291,950
Deficiency of telegraph revenue to meet interest on telegraph stock, for year ending December 31, 1872 .....	113,583 or 567,915

In other words, the financial result of the British telegraph, under state management, up to the commencement of 1873, showed a deficiency of receipts adequate to meet expenses and interest (the latter calculated at three per cent., the rate on consols, by which the capital is represented) of nearly six hundred thousand dollars. Had five per cent. been paid—the lowest rate at which the United States has been able to borrow, and a lower rate than France or the best railroad corporation in the United States can obtain—the deficit would have been increased to nearly one million five hundred thousand dollars.

It is also to be observed that the capital account of the British government telegraph is not yet closed, but a further addition, on account of arrearages, of at least \$10,000,000 is anticipated. At the same time, many of the expenses actually incurred in the management of the telegraph are charged to the account of the post-office, and so go to swell the cost of the mail department of the post-office, and diminish that of the telegraph department.

For example, the telegraph manager receives a salary from the telegraph bureau of £300, and another from the post-office of £1,500, although his duties are exclusively telegraphic. In a similar way many of the extensions and alterations of buildings to accommodate the telegraph are charged upon the post-office. In short, the whole showing is a most singular one, not at all creditable to official management. It is likely to prove also, we should think, something of a wet blanket on Mr. Creswell's project that the Government in this country should, in addition to all its other ill-performed work, take upon itself the business of constructing, operating, and leasing telegraphs.

Mr. LOWREY. I will remind the Committee that Mr. Monsell was obliged to leave his seat in the English cabinet before Mr. Gladstone went out, being driven out by the fact that he permitted his subordinate, Mr. Scudamore, to take from the government post-

office savings-bank of the money which I have before mentioned a very large sum, amounting to nearly £2,000,000, without authority of law, to make up the deficit in the working of the telegraph. Mr. Monsell was succeeded by Sir Lyon Playfair. The figures given by the Postmaster-General on the English returns for the year 1872 show a considerable profit, having left out the important figure to which we called attention. The actual figures for the year—that is to say, bringing the business down to the 1st of Jan., 1873—as derived from the English document, show an actual deficit of £113,583, or \$567,915, to which is to be added the further sum which we have demonstrated should have been charged to the actual expenses of the year, instead of to capital account, of about £1,139,000. So the Committee can see to what Mr. Hubbard and the Postmaster-General are inviting the American people.

The CHAIRMAN. Have you the report itself?

Mr. LOWREY. I have not at present.\*

The CHAIRMAN. Is Sir Lyon Playfair still in office?

Mr. LOWREY. No; he went out with Mr. Gladstone. He came in just as Gladstone's administration went out.

The CHAIRMAN. Has any attention been called to the subject since the Disraeli administration came in?

Mr. LOWREY. Not that I have heard of. Even if there were, we would not hear of it officially for a year or two.

The CHAIRMAN. Have you seen any English review about it since the document came out?

Mr. LOWREY. No I have not.

The CHAIRMAN. Does Mr. Scudamore remain in office?

Mr. LOWREY. Yes, he is a permanent official.

The CHAIRMAN. Has he made any response to the report?

Mr. LOWREY. This is his own document.

The CHAIRMAN. It can hardly be his. It is Sir Lyon Playfair's.

Mr. LOWREY. It is a treasury document showing the state of the post-office accounts. Of course it is a paper that cannot be responded to.

The CHAIRMAN. Some explanation might be made of the way in which the accounts were made up.

Mr. LOWREY. As to the method of making up accounts, that is formal. I suppose Mr. Scudamore has said all he could say in his various appearances before the investigating committee of Parliament.

The CHAIRMAN. Do you understand that it is a detailed account?

Mr. LOWREY. Yes; we have read the detailed account for the previous year. The following year, in the account which we have got, they have suppressed the particulars, but charged a separate sum, which we assume is covered by the same sort of expenditure. Doubtless it did attract a great deal of attention. In 1873 a committee on public accounts undertook an investigation of the telegraph business, which by that time had run into great discredit in England, not only because it failed to perform the service as it was expected, but because the expenditures were believed to have run far beyond what had been anticipated.

I shall stop to say that it is not proposed by us to question the manner in which the English telegraph is managed, nor do I suppose that even Mr. Hubbard's advocacy of his selected exemplar can put Mr. Scudamore on trial here. Wherever his conduct of the telegraph might be examined I know no reason to doubt that, however the wisdom of his scheme

\* I have since received the report referred to by the Chairman, a copy of which will be found in Appendix C.

might be questioned, his personal integrity of motive would be vindicated. I am passing through this part of his connection with public affairs only because a serious warning is thus to be derived.

A committee on public accounts was directed to make further investigation into the irregularities connected with the post-office and telegraph service, which was the subject of comment in that first report of March, 1873. I read from the report of that committee:

(To be continued.) <sup>APPARENTLY</sup> NOT CONTINUED.

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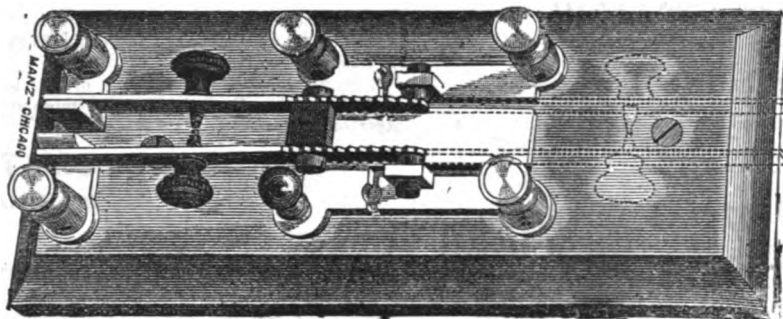
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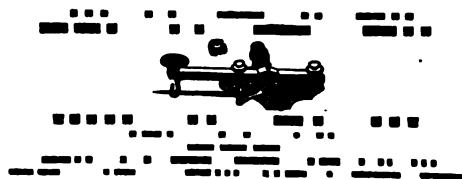
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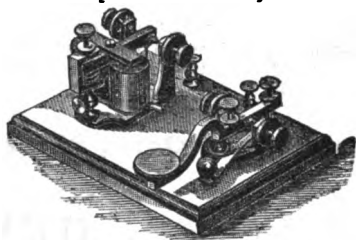
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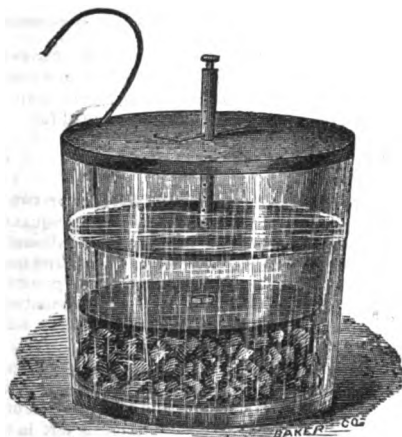
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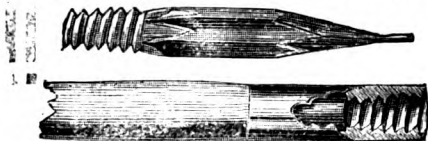
New York, May 30, 1874.

We are offering our TELEGRAPH INSTRUMENTS at 20 per cent. Discount from our list, or from the present published price list of any other manufacturer of first-class Telegraph Instruments. Quality will be strictly maintained.

L. G. TILLOTSON & CO.,  
8 DEY STREET, NEW YORK.

PHILADELPHIA: 54 South Fourth Street.  
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## ORTON'S PATENT PENCIL HOLDER.



"Save the Pieces."

This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS.

When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm. Price 25 cents each. Sent by mail on receipt of price.

Price per dozen, - - \$1.80.

AGENTS FOR TOWNS AND COUNTIES WANTED.

GEO. H. BLISS & CO.,

GENERAL AGENTS,

No. 41 THIRD AVENUE, CHICAGO, ILL.

WILLIAM E. DAVIS,

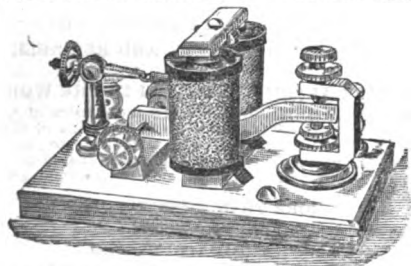
Manufacturer and Dealer in

TELEGRAPH INSTRUMENTS,

341 Newark Avenue, Jersey City, N. J.

Now offer for sale, or will manufacture to order all kinds of Telegraph Material.

NEW STYLE SOUNDER—"UNCLE SAM."



Price \$6.00.

COPPER  
OFFICE AND MAGNET WIRE,  
BRAIDED AND WOUND,  
SINGLE and DOUBLE, with COTTON,  
LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.

Manufactured and for Sale by

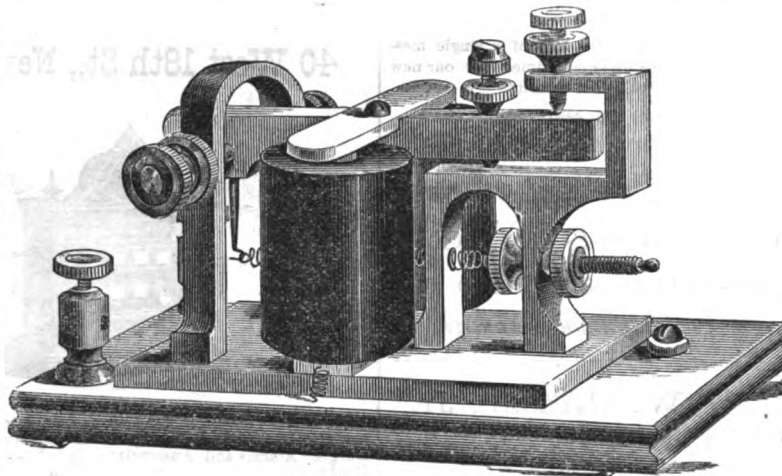
WESTERN ELECTRIC MANUFACTURING CO.  
CHICAGO.

## PARTRICK & CARTER'S Giant Sounder Perfected.

OFFICE & MAGNET WIRE,

BRAIDED AND WOUND, SINGLE and DOUBLE,  
with COTTON, LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every Instrument Warranted Perfect.

PRICE \$7.50.

Sent C. O. D. by Express. On Receipt of Money Order, \$7.00.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.; or \$8.00 if Money Order for the amount sent in advance.

The latter plan will additionally save the purchaser the Express charges for returning money.

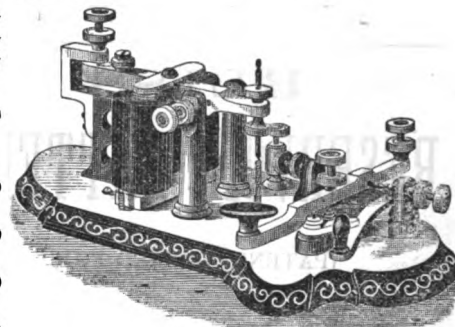
Price of single instrument, good for one mile or less, without Battery, &c. .... \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. .... 7 50

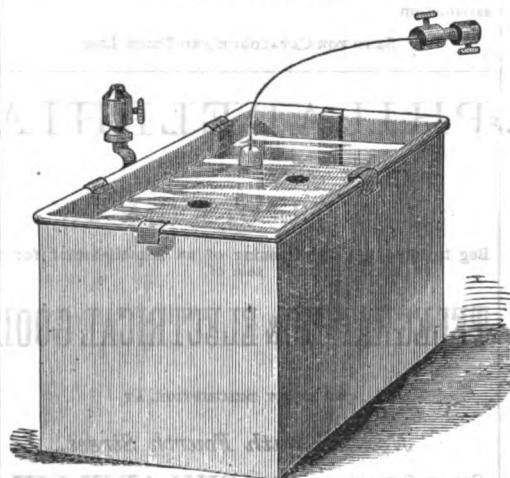
Price of single instrument, good for one to twelve miles, without Battery, &c. .... 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. .... 8 50

THIS IS WARRANTED TO BE, BEYOND ALL COMPARISON THE BEST APPARATUS ever offered for the use of STUDENTS OF TELEGRAPHY. Being excellent Morse Instruments, substantially made and nicely finished, with nothing left out of their construction which pertains to a complete sounder and key combination set; NOTHING MADE IN MINIATURE OR IN AWKWARD AND UNUSUAL SHAPE, as is done with the very cheap affairs usually offered as learners' apparatus. They are equally well suited for



## EAGLES' METALLIC BATTERY.



THE EAGLES METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

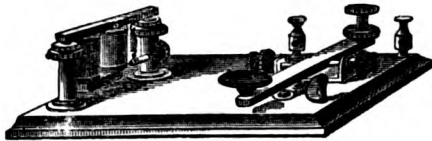
For OPEN CIRCUITS, where all other gravity batteries are acknowledged FAILURES, the Eagles Battery is found to be, in every respect, A PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - - \$2.25  
No. 2, " " " " - - 2.00

PARTRICK & CARTER, Sole Agents,

32 South 4th St., Philadelphia, and 22 Dey St., New York.



PATENTED JUNE 24, 1873.

## SPECIAL NOTICE.

THAT

"THE BEST IS ALWAYS CHEAPEST"

as demonstrated by the unprecedented demand which has arisen for our

## Excelsior Telegraph Apparatus

For STUDENTS and AMATEURS.

The custom introduced by us of making Agents of Managers and Operators, and sharing the profits from the sales of these instruments with them, has also assisted in increasing our sales to such an extent that we have been compelled to enlarge our facilities for their manufacture.

We are now prepared to furnish these unrivalled Amateur Instruments, with or without Office Outfits, in any quantity, and at a moment's notice. Our Agents may now send in their orders as rapidly as they please, and can rely upon their being promptly executed.

PRICES AS HERETOFORE.

Instrument Complete, Key and Sounder ..... \$6 50.  
Instrument, with Office Outfit ..... 7 50.  
Two Instruments and Outfits ..... 14 50.

L. G. TILLOTSON & CO.

8 DEY STREET, NEW YORK.

PHILADELPHIA: 54 South Fourth Street.

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CHAS. T. CHESTER

104 CENTRE STREET, N. Y.  
TELEGRAPH ENGINEER,  
And Manufacturer of

INSTRUMENTS, BATTERIES,

AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES.  
Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their business, domestic and foreign, enabling them to keep pace with telegraphic progress.  
They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

F. L. POPE & CO.,

Manufacturers and Dealers in

Telegraph Instruments and Supplies,

38 Vesey Street, New York.

STANDARD TELEGRAPH INSTRUMENTS,  
RELAYS SOUNDERS, REGISTERS  
AND KEYS,

BATTERIES,  
INSULATED WIRES,

CHEMICALS of all kinds, etc.  
THE NONPAREIL TELEGRAPH INSTRUMENT for amateurs, learners and short lines.  
Over 2,000 of them have been sold, and the demand for them continues unabated.

Globe Lightning Arresters,  
Bradley's Apparatus for Electrical Measurement,  
Bradley's Box Relays and Sounders  
and Naked Wire Helios and Magnet Spools.

Also, Agents for Hochhausen's Superior Low-Priced Telegraph Instruments.

Sole Agents for the

Eagles Metallic Galvanic Battery.

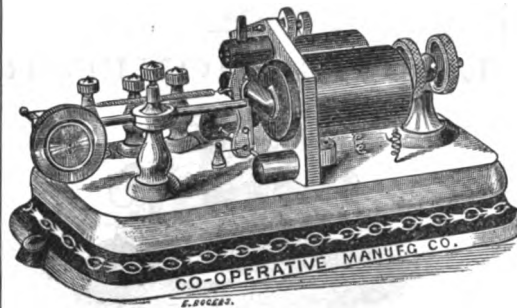
The demand for this Battery is rapidly increasing, and it is conceded by all who have used it to be the *Best and most Economical* Battery, for telegraphic and other purposes, offered to the public.  
Descriptive Circulars and Price List forwarded upon application to

F. L. POPE & CO.,

P. O. Box 5503.

38 Vesey St., N. Y.

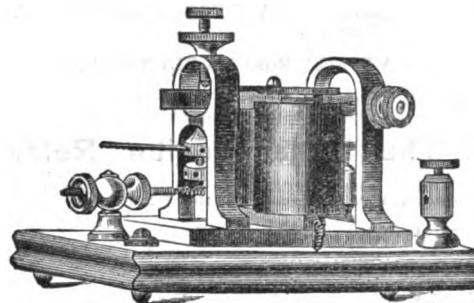
## Co-operative Manuf'g Co., 216½ Walnut St., Phila.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. Is finely finished.

Price, - - - \$16.



Railroad Sounder.

This Sounder is noted for its loud, clear and firm tone, entirely free from that sharp ring peculiar to most instruments, and which eventually becomes so painful to the ear of the operator.

N.B.—We have improved our Sounders by using capstern head screw and nut, as represented in cut.

Price, \$7.

By the Dozen, \$6 50.

Sent by Express, C. O. D., or upon receipt of money order.

SEND FOR PRICE LIST.

W. R. BALDWIN, Manager, 216½ Walnut St., Phila.

CALLAUD BATTERY,  
KEPT ON HAND,

AND  
Orders filled by  
W. MITCHELL McALLISTER,  
728 Chestnut Street, Philadelphia,  
CHARLES WILLIAMS Jr.,  
109 Court St., BOSTON, MASS.

AND BY  
THE WESTERN ELECTRIC MANUF'G CO.,  
Agents for the United States,  
220 East Kinzie St., Chicago, Ill.

LECLANCHE BATTERIES.

IMPORTANT NOTICE.



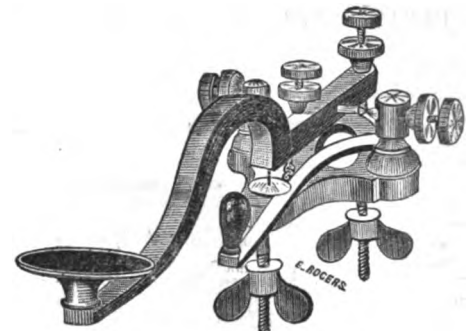
After January 1st, 1875, we will allow 20 Cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

THE LECLANCHE BATTERY CO.,  
40 West 18th St.

Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
8 Dey St.

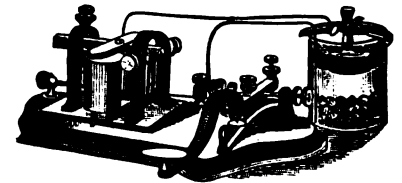
PHILADELPHIA: 54 South Fourth Street  
CINCINNATI: 22 West Fourth Street.



No. 1 Key.

This Key is of a beautiful design, and durable in construction, and is perfect in all things which constitute an excellent working Morse Key. No. 1 Key Curved or Straight Lever.

Price, - - - \$4 75



Co-operator's Learner's Instrument.

A complete outfit, embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practicing or communicating purposes, being in all respects a regular Morse Instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined. The instructions are clear and practical, and contain all information necessary for the student. All technical terms and expressions are avoided, as they only perplex and make the road to knowledge more difficult.

Learners' Instrument complete, \$9.50

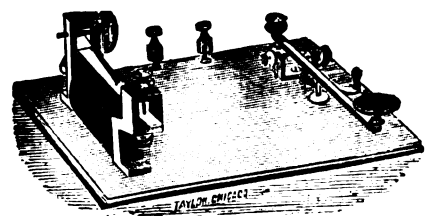
without Battery, \$8.00.

No. 2 Learner's \$5, with Battery, \$6 50.

Sent by Express, C. O. D., or upon receipt of money order.

THE AMATEUR'S  
Telegraph Apparatus.

(PATENTED APRIL 16TH, 1873.)



With this Instrument is furnished

A Complete Outfit for the Student

INCLUDING

BATTERY  
CHEMICALS, and  
MANUAL.

There are several thousand in use.

PRICES:

Complete Outfit ..... \$7 50  
Sounder and Key ..... 6 50  
" " with Out-Out and Lightning Arrestor 8 00

GEO. H. BLISS & CO.,

41 THIRD AVENUE,

CHICAGO, ILL.





# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 6.

NEW YORK, MARCH 15, 1875.

WHOLE NO. 177.

## THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's *Elektromagnetische Telegraph.*]

(Continued from page 66.)

### THE COURSE OF THE CURRENT AND THE ACTING TOGETHER OF THE ELECTRICAL AND MECHANICAL POWER.

In the operation of the Hughes system it is necessary that the poles of the battery should be in opposition to the poles of the natural magnets. Where this cannot be so arranged in a permanent manner, a commutator or pole changer is provided, as shown in Figure 21. The wire L is fastened in the clamp L, the ground wire in clamp T; Z and K are the poles of the battery. The clamps L and T are connected with both lower metallic rims of the commutator U; one of the two upper metallic rims conducts through the wire 5 to the lower axis P of the sledge, the other through wire 6 to one of the ends of the coil E, and also to the metallic axis bed of the armature  $\pi$ . The other end of the wire of the coil is connected through 7 with a handle or arm X, whose contact piece O, through wire 8, is in connection with spring R', against which the cam  $g$  of the printing axis lies in a position of rest. The zinc pole Z of the battery is connected with the lower axis P of the sledge and also with wire 5. The copper pole is connected to the axis K'' of the twenty eight keys.

At the sending station, when both the holes 2 and 3 of the commutator are stopped, the zinc pole of the battery is to the ground, and the instrument is ready for the transmission of a message. If a key is now depressed a + current will flow from K to the axis K'' and to the protruded key pin, to the upper part S of the sledge, thence to its upper axis Q (Figure 20), which is connected to the metallic parts of the work Y Y, and also to the printing axis  $\delta'$ . From  $\delta'$  the current proceeds to cam  $g$ , which is against spring R'; from R' over 8 O and the arm X, over 7 to the coil of electro magnet E, thence over 6 to the lower horizontal bar at U, and thence over the plug in hole 8 to the clamp L, from whence it flows to line and the distant station. As this current passes through the electro magnet the armature is released, the printing axis revolves, and the current takes another course, a circuit being established between  $\pi$  and  $d\delta'$ . Its route is now from the metallic parts Y Y of the works, the axis H of the lever  $d\delta'$ , over  $\pi$  to the axis bed M, and through U and 8 as formerly, but the coils are cut out, and the current flows with full power to the line. At the receiving station the arrangements are the same, except that the commutator plugs are in holes 1 and 4. The arriving current takes its way over L U 1 5 S P to the metallic parts of the work, and further through  $\delta' g R' 8 O X 7 E 6 U 4$  and T to earth at P'.

It will now be easily comprehended that a current

which is transmitted during the revolution of the printing axis, can have no influence on the impression, and thus a regular interval of time must ensue between the depression of one key and that of another. While in action the printing axis revolves seven times during one revolution of the typewheel and sledge; hence the typewheel and sledge have made only one-seventh of a revolution, passing over but four key pins, when the revolution of the printing axis is completed.

It follows from this that the operator, in depressing keys successively, must always allow a space of four keys between a depressed key and the key to follow. For example, the letter A is sent, and it is desired to send either of the letters B C D or E in immediate succession, it would not be possible to do so in

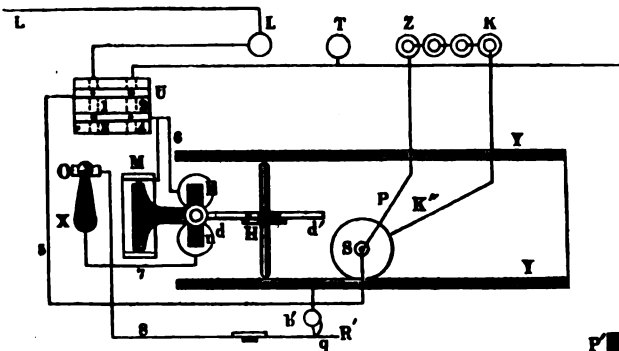


Figure 21.

the same revolution of the sledge, for the printing axis would not have completed its revolution after printing A in time for any letter between A and F. Each letter within the range of four following the last letter transmitted requires a full revolution of the sledge. Thus it will be seen that the time required to transmit a word is not wholly governed by the number of letters it contains, but to a greater extent by the peculiar position of the letters as they follow each other down the alphabet from A to Z. For instance, the word "Hotel" would require two revolutions, thus:

First revolution..... blank ..... H O T  
Second " ..... E L

Paris would require three revolutions:

First..... blank ..... P  
Second..... A R  
Third..... I S

Berlin requires five revolutions, and the word Telegraphic eight, viz:

First..... blank ..... T  
Second..... E L  
Third..... E  
Fourth..... G R  
Fifth..... A P  
Sixth..... H  
Seventh..... I  
Eighth..... E

A skillful operator will send one or more letters during every revolution of the sledge. Should this

not be done, not only would loss of time ensue, but the synchronism of the instruments would be imperiled, as it is never absolutely correct. The perfection is given by the correcting wheel, which can act only at the sending of a letter.

In ordinary practice the number of revolutions of the sledge and type wheel range from 110 to 120 per minute. Occasionally it is run at a greater speed. In this respect much depends upon the length of line operated, and the degree of insulation, and also to the skill of the operator. For land lines of 250 to 300 miles in length the speed is usually maintained at about 120 revolutions. At this rate the number of words transmitted per minute will average 31. A greater speed would allow of a greater number of words and *vice versa*.

Experience has shown that while a speed of 120 revolutions per minute can advantageously be maintained upon lines of 250 or 300 miles, yet upon circuits of much greater length, say from 400 to 500 miles, the number of revolutions should not exceed 100, and upon submarine lines of very great length not more than from 18 to 20. In the latter case a slight alteration would be necessary in the construction of those parts which couple the printing axis with the wheel work, as a speed from 40 to 50 revolutions per minute is required in order to procure the proper action of the printing axis under the present arrangement.

(TO BE CONTINUED.)

## IMMENSE ELECTRO-MAGNET.

The Sheffield Scientific School has just received a very important addition to its physical apparatus in an immense electro-magnet, together with the accessories necessary for the study and illustration of magnetic phenomena. This apparatus has been presented to the school by William Wallace, of Ansonia, who for many years made a special study of electricity and magnetism, and for his own use has constructed some of the largest and most efficient pieces of apparatus ever employed in this department of physics. This magnet is only second in size, it is believed, to one other in the country which was made by Mr. Wallace a few years ago, and was purchased by the Stevens Institute of Technology. The Yale magnet weighs altogether near half a ton, and is capable of lifting, it is said, twenty times that weight, or over ten tons, when in full action.

## EFFECT OF FLAME ON AN ELECTRIC SPARK.

Mr. S. J. Mixter notices a curious effect of a gas flame on the current of a Holtz machine. The jet consisted of a glass tube drawn out to a point, and the flame had a length of about an inch and a diameter of only an eighth of an inch. Inserting this between the two terminals of the machine, the length of spark obtainable was at once increased from less than ten inches to over twelve, the full distance to which the balls could be separated. The same increase was not obtained on simply inserting a conductor between the two terminals, a ball an inch in diameter only lengthening the spark about an inch.



## SOCIETY OF TELEGRAPH ENGINEERS.

INAUGURAL ADDRESS, BY MR. LATIMER CLARK,  
PRESIDENT, JANUARY 18, 1875.

GENTLEMEN: On assuming the Chair as President of the Society of Telegraph Engineers, I desire to return you my thanks for the confidence you have shown and the honor you have done me in placing me in so responsible a position. Although I shall willingly devote and unite my best efforts with yours to uphold the interests and dignity of the Society, and to increase its utility, and although I shall fulfill these duties as a labor of love, I am conscious that I shall have to ask your continued forbearance and indulgence for deficiencies.

My task is, however, but a light one compared with that which devolved on my predecessors in this chair. They had to create and establish a Society and to perfect its organization; and, thanks to their wise and skilful guidance, and to the liberal assistance of the Institution of Civil Engineers, we are able to meet in this magnificent room this evening some 600 members strong, and to chronicle nothing but prosperity and progress.

In this respect, indeed, we have ground for sincere congratulation, for even the parent Society, the Institution of Civil Engineers, one of the most prosperous and flourishing institutions in the world was, I believe, thirty years in existence before it possessed as many members as we now number in our single branch of the profession.

The Electric Telegraph is not the creation of any one mind, nor did it come upon the world suddenly or in a complete form; but, like the pale beams of the rising moon, its dawn may be traced back for generations, continually brightening and gaining strength as fresh additions to our knowledge rendered the problem more feasible.

Practical telegraphy is, however, a creation of the present generation. Within the memory of most of those now present it has burst into existence and spread throughout the world with a celerity and splendor characteristic of the mysterious element which it has bent to its service, so that to-day—from the distant shores of the Pacific Ocean to the eastern limits of Asia—not only every land, but almost every town and village, has been united by the electric wire, and distance and time have been so changed to our imaginations that the globe has been practically reduced in magnitude, and there can be no doubt that our conception of its dimensions is entirely different to that held by our forefathers.

It is impossible to avoid looking back and inquiring what has been the cause of this singular development; and, although the ground has been trodden so often, I cannot refrain from passing in hasty review some of the steps in the rise and progress of telegraphy. For, though the history of our art may receive but little attention from the world at large, it must ever possess an interest for the members of this Society, many of whom have borne so prominent a share in its creation and development.

There was a fabulous story among the old authors that two needles touched by the same magnet, and suspended within an alphabetic circle, would move in unison at whatever distance they might be separated. The most interesting form of this story is that related by Joseph Glanvill, M.A., in his "*Seppis Scientifica*," published in 1665. He says: "That men should confer at very distant removes by an extemporary intercourse is another reputed impossibility; but yet there are some hints in natural operations that give us probability that it is feasible, and may be compassed without unwarrantable correspondence with the people of the air. That a couple

of needles equally touched by the same magnet, being set in two dials exactly proportioned to each other and circumscribed by the letters of the alphabet, may affect this magnet, hath considerable authorities to vouch for it. \* \* \* Now, though this pretty contrivance may not yet answer the expectation of inquisitive experiment, yet it is no despicable item that by some other such way of magnetic efficiency, it may hereafter with success be attempted when magical history shall be enlarged by riper inspections, and it is not unlikely but that present discoveries might be improved to the performance."

Now here we have the early dawn of the idea of an electric telegraph.

On the 1st of February, 1758, a Scotchman, Chas. Marshall, of Paisley, then resident at Renfrew, published in the *Scots Magazine* a full and clear description of a practicable electric telegraph, and suggested the coating of his wires with an insulating material; and he may therefore be considered, in a sense, the inventor of the telegraph.

In 1800 Galvani and Volta introduced the voltaic pile, which forms so important a feature of the telegraph of to-day.

From this time many other forms of telegraph were proposed which it is unnecessary to notice, except that in 1809 Dr. Schlemmering laid before the Academy of Science at Munich a plan in which, for the first time, the galvanic battery was employed for the transmission of the current and the decomposition of water. He also expressed the hope that his system might serve to telegraph between Munich and Augsburg, and took much pains to make it known.

In 1816 our late lamented member, Sir Francis Ronalds, produced his electric telegraph, and at great expense and trouble erected a considerable length in his garden at Hammersmith. He employed frictional electricity and only one wire, and exhibited his signals by the divergence of pith balls, combined with rotating dials working synchronously—a system afterwards brought to great perfection in the printing telegraph of Prof. Hughes. Sir Francis Ronalds will always take a high position in the history of the telegraph—not so much on account of the excellence or originality of his invention, as on account of the confidence and ardor with which he pursued his experiments and endeavored to bring them to the notice of his countrymen. With wonderful prevision he fully perceived its value and foretold its destiny. His "*Description of an Electrical Telegraph*," which was published in 1823—the first book ever published on the subject of Electric Telegraphy—might almost serve for a description of a telegraphic system at the present day. He proposed the establishment of telegraph offices throughout the kingdom, and pointed out the benefits which the Government would derive from their existence. He described methods of insulating the wires either on poles or underground, with all the details of tubes, joints and testing boxes, testing stations, linemen, and inspectors, as at the present day. But the most interesting and singular point to my mind is the clearness with which he foresaw and explained the phenomenon of retardation of the electric current by induction in underground wires—a phenomenon which has so greatly engaged the attention of electricians in the present day.

The influence of this is so great that on our Atlantic cables we do not transmit messages at a greater rate than fifteen or twenty words per minute, whereas, if the effects of induction could be removed, we might transmit three or four hundred words per minute. After showing that the discharges through his eight miles of insulated wire

were apparently instantaneous, he says—"Yet I do not contend, nor even admit, that an *instantaneous discharge* through a wire of unlimited extent would occur in all cases." And recurring to the subject further on he says—"That objection which has seemed to most of those with whom I have conversed on the subject the least obvious appears to me the most important, and therefore I begin with it, viz., the probability that the electrical induction which would take place in a wire enclosed in glass tubes of many miles in length (the wire acting like the interior coating of a battery) might amount to the retention of a charge, or at least might destroy the suddenness of the discharge, or, in other words, might arrive at such a degree as to retain the charge, with more or less force, even when the wire is brought into contact with the earth." He then proceeds to suggest methods of obviating the difficulty, or experimentally demonstrating its extent and character.

There can be no doubt that if Ronalds had worked in the days of railways and joint stock enterprise, his energy and skill would have triumphed over every difficulty, and he would have stood forth as the practical introducer of telegraph. But he was thirty years before his age, and the world was not ready for him.

Having completed his arrangements, he modestly invited Lord Melville—on the 11th July, 1816—to witness his experiments, in order that he might demonstrate the nature and merits of his invention. The reply he eventually received was eminently characteristic of the neglect, and even contempt, with which science and scientific men were, and to some extent still are, regarded by statesmen.

"Mr. Barrow presents his compliments to Mr. Ronalds, and acquaints him, with reference to his note of the 3d instant, that telegraphs of any kind are now wholly unnecessary, and that no other than the one now in use will be adopted.

"Colonial Office, 5 Aug., 1816."

The inventor had chosen an unfortunate time. The great war of the century was concluded; the Government officials were doubtless closing up their affairs after a weary session, and were thinking only of salmon and grouse; telegraphs and all other new-fangled ideas were wholly unnecessary; and Mr. Ronalds was probably only one amongst a dozen of inventors who received their *coup de grace* on that unlucky August morning.

Ronalds was, however, contending against one difficulty which, as we now know, would have been almost insuperable. Although very familiar with the galvanic pile, and although Schlemmering had used it for telegraphs seven years previously, he was still working with high tension or frictional electricity.

In 1819 Ørsted discovered the effect of the current in causing a deflection of the magnetized needle; and in 1820 Ampere proposed to construct a telegraph by means of the voltaic battery, the coil of wire and the magnetized needle. This was followed by the long series of Faraday's wonderful electrical researches.

In 1827 Dr. Jacob Green, of Jefferson College Philadelphia, wrote as follows: "In the very early stage of electro-magnetic experiments it had been suggested that an instantaneous telegraph might be constructed by means of conjunctive wires and magnetic needles. The details of this contrivance are so obvious, and the principles upon which it is founded are so well understood, that there was only one question which could render the result doubtful. This was, whether by lengthening the conjunctive wires there would be any diminution in the electrical effect

upon the needle. \* \* \* Had it been found true that the galvanic fluid could be transmitted in a moment through a great extent of conducting wire, without diminishing its magnetic effect, then no question could have been entertained as to the practicability and importance of the suggestion adverted to above with regard to the telegraph. Mr. Barlow, of the Royal Military Academy (at Woolwich), who has made a number of successful experiments and investigations in electro-magnetism, fully ascertained that there was so sensible a diminution with only 200 feet of wire as to convince him at once of the impracticability of the scheme."

There can be but little doubt that this published opinion of so eminent a man as Prof. Barlow, which occurs in the *Philosophical Transactions*, had the effect of retarding the introduction of electric telegraphs by many years.

In the same year Ohm published the celebrated mathematical formulæ which bear his name, and, had they been known and duly appreciated at the time, they would at once have dispelled all misgivings as to the distance at which electrical effects might be rendered sensible. They were not, however, translated into English until 1841.

In 1828, Green, of Nottingham, published his valuable mathematical investigations of the distribution of electricity on the surface of conductors of various forms.

In 1834 Whitestone immortalized his name by his magnificent experiment on the velocity of electricity, and by his other researches on the subject, which doubtless caused many minds to ask themselves, as Ronalds had done, "Why has no serious trial yet been made of the qualifications of so diligent a courier?"

We now approach the memorable epoch of 1837. Scientific men were in possession of every knowledge and appliance necessary for creating a perfect electric telegraph; the subject was commonly lectured on; fresh methods of communication continued to be invented, among which I will only mention that of Baron Schilling, who, in 1832, employed five wires insulated with silk, and five vertical needles.

Railways had also now come into extensive use, and the world was in every way ripe and ready for the practical introduction of the telegraph. In March, 1836, Mr. Wm. F. Cooke appears to have been present at one of these public lectures, and, struck by the adaptability of the telegraph to the requirements of railway traffic and commercial use, at once made the subject his exclusive study. Returning to England on the 22d April, he appears to have devoted the remainder of the year to the study of the subject and the perfection of his ideas, the most important feature of which appears to consist in the fact that he for the first time introduced the use of an electro-magnet for telegraphic purposes. His first model, made out of a musical snuff box with an electro-magnetic escapement, was made at Heidelberg. He first exhibited an instrument of this form to Prof. Faraday in November, 1836, and subsequently to the directors of the Liverpool and Manchester Railway, in January, 1837, with a view to its adoption on the incline of the Liverpool Tunnel, which was then worked by a rope and a fixed engine. The instrument gave sixty signals, and was considered too novel and complex for the purpose required; and before simpler instruments could be constructed they adopted a pneumatic telegraph.

We now arrive at the epoch of 1837, the year in which the first practical telegraphs were introduced. Several electric telegraphs were invented during this year, any of which, in the absence of others, would

without doubt, have laid the foundation of the practical telegraph. Among them those of Cooke, Wheatstone, Morse and Steinheil require especial mention. The telegraph of Prof. Steinheil deserves notice on account of its great ingenuity and completeness. He employed only one wire, and transmitted his signals either by sound or by an alphabet of dots printed on a strip of paper, and he employed the earth circuit. His experiments were performed on a distance of several miles between the Royal Academy at Munich and Bogenhausen, and his telegraph was certainly very far in advance of any other existing at that date. His system was not, however, brought into further use at that period.

In February, 1837, Mr. Cooke, by the advice of Prof. Faraday and Dr. Roget, made the acquaintance of Prof. Wheatstone, and in June they had formed a partnership and taken out a joint patent. Much difference of opinion has arisen as to the due apportionment of the merit of these gentlemen in connection with the invention or introduction of the electric telegraph; but it is not our purpose to-day to inquire into the merit of these respective claims. Happily, abundant documentary evidence exists to enable those who take an interest in the question to form their own opinions upon it. It appears to me, however, that neither of those gentlemen can in any sense claim to have been the inventor of the electric telegraph. In fact, if we except the use of the electro-magnet and the mechanical escapement, I do not find, in their inventions of this period, any important novelty of combination or of principle which appears likely to survive in that process of "natural selection," that "struggle for existence," which goes on as persistently among the productions of art as in the province of Nature. Their claim for distinction must rest rather on the energy and success with which they introduced their system into practical use, and compelled the world to recognize its merits.

By the deed of partnership executed between these gentlemen, it was arranged that Mr. Cooke was to continue the entire practical management and control of their affairs; and accordingly, on the 27th of June, Mr. Cooke was introduced to Mr. Robert Stephenson, who at once took the greatest interest in the invention, and lent it all his influence and assistance. It is gratifying to find the name of one of the fathers of the railway system thus early acting as a father to the electric telegraph.

On the 4th of July the apparatus was exhibited to Mr. Stephenson, and by the 25th their first experimental line was in operation between Euston and Camden, and was worked in the presence of Professor Wheatstone, Mr. Stephenson, Mr. Charles Fox, Mr. Brunel and Sir Benjamin Hawes.

The system exhibited was still that of the electro-magnetic escapement and rotary dial—the needle telegraph, which has been since so intimately associated with their names, not having been yet perfected.

At the same time Prof. Morse was occupied in introducing his electro-magnetic telegraph in America. This telegraph, from its exquisite simplicity, has come into universal use throughout the world, and has conferred immortality on the name of its inventor. The idea had long existed in his mind, and as early as 1835 he had exhibited his experiments to private friends, but there appears no published record referring to his invention earlier than a letter in the *New York Observer* of April 15, 1837, by his brother, S. E. Morse, and in this letter he speaks of the invention as requiring twenty-four wires. On the 10th of March a circular letter had been sent to certain collectors of customs and others, desiring information with reference to telegraphic communica-

tion, and it was this circular which probably evoked the letter in question. On the 27th September Prof. Morse wrote a letter to the Secretary of the Treasury of the United States, which shows that he had allowed the subject to lie dormant, but he promised to have a complete apparatus in operation by the 1st January, 1838. His first experiment, over half a mile, was made on the 2d October, 1837, and on the 6th October he filed a caveat in the Patent Office at Washington. I believe the first working telegraphic line erected in the United States was that between Washington and Baltimore, which began work in 1844.

TO BE CONTINUED.

## THE CANADIAN TELEGRAPHS.

OTTAWA, ONT., Feb. 25, 1875.

In the Committee on Railways, Canals and Telegraphs, the bill on the Marine Electric Telegraph came up for consideration. The clauses were passed to the fourteenth, which affects the existing companies. Lord William Hay, as the Director of the Anglo-American, addressed the Committee at some length. He explained how seriously the proposed legislation would affect their interests, and maintained that the company had a legal, moral and equitable right to land their cables on Nova Scotia.

Mr. McKenzie said that a Newfoundland monopoly gave the company no right to extend its cable to Cape Breton. Privileges that were conferred upon an original company did not apply to more than one-twentieth part of the present capital of £7,000,000 of the company. The £7,000,000 was the aggregate capital of a combined company who had no claim or interest in the monopoly. The fact was that the company could only be considered as squatters when they had no legal or equitable claim over any part of the course, except in Prince Edward Island. He contended, too, that no mere prescriptive right could give the company exemption from the municipal powers exercised by the Government. The dispatch of the Colonial Secretary of the 18th of January, 1858, stated the reasons for disallowing the act giving the company a monopoly in Nova Scotia to be because Her Majesty's Government considered it highly inexpedient, both for the interests of the Province and the Empire, to grant such exclusive privileges. The British Government, therefore, held the same views in regard to the monopoly as did the Dominion Government. As to the legal rights of the company, none existed.

A mere agreement with the Nova Scotia Telegraph Company did not entitle them to a monopoly of landing cables in Nova Scotia. All that the government asked in the bill was to put an end to a monopoly of twenty years, caused by the act of another colony. The real point of contention was, that because the company had a monopoly for twenty years, a monopoly now terminable if the Nova Scotia Government wished it, they, therefore, should be allowed to keep it. In other words, were the company to be allowed to retain their monopoly when they had received no legislative sanction? If the company objected strongly to the proviso to the clause, it might be struck out; but it was inserted to protect them.

After a protracted discussion the question as to the existence of legal rights was referred to a sub-committee consisting of Sir John Macdonald and Messrs. Blake, Mousseau, Moss and Fournier.

The Committee then adjourned.

FROSTED feet may be relieved of soreness by bathing in a weak solution of alum.

## INDO-EUROPEAN TELEGRAPH.

The directors state in their report for the year 1874 that the receipts amounted to £79,466, as compared with £54,897 in 1873, showing an increase of £24,569, or nearly 45 per cent. This large addition to the receipts might be attributed to several causes, among others to the greatly improved working of the company's system, to the famine in India and the consequent speculation in the rice trade, and to the general annual increase which, as a rule, occurred in telegraphic business. The expenditure on commercial account amounted for the twelve months to £15,260, against £13,764 for the year 1873, being an increase of £1,496. The Government had agreed to reduce the minimum rent payable by the company for the special wire from £12,000 to £6,700 per annum, and to give the company permission to carry South Russian messages over the wire, with certain modifications as to the tariffs debited to extra European and other correspondence. The directors had already paid an interim dividend for the six months ending the 30th June last, and they now proposed to declare a similar dividend for the past half-year, free of income-tax, making 5 per cent. for the whole year. This would absorb £21,250, leaving £3,163 undivided. The capital account showed a total expenditure of £423,000.

## SUBMARINE TELEGRAPH COMPANY.

The report of the directors states that the questions between the Post-office and the company have been arranged, and that the company's claim has been fully admitted and paid. In the last report the directors mentioned that an agreement had been executed with the Eastern Telegraph Company for a lease to that company of a special wire for the transmission of messages to and from Egypt, India and the East, *via* Marseilles, and that the contract only awaited the sanction of the French Administration to be carried into effect. The French Administration has recently given its consent to the agreement, and the special wire was handed over to the Eastern Company on the 1st February, and is now being worked by the company in transmission of their messages *via* Marseilles. The negotiations with the French Administration for establishing a direct special service between the company's office in London and the Paris Bourse has been at length successfully concluded. The transmission of telegrams by these direct wires commenced on the 11th January last, and the time occupied in forwarding and receiving Stock Exchange messages is now greatly reduced. The directors trust that the increased facilities thus afforded will give satisfaction to the commercial world. Many of the proprietors will, no doubt, recollect the circumstances under which the cable between Beachy Head and Dieppe was laid down in the year 1860, and that it was then considered probable that the improvement of its insulation might entail heavy expenses upon the company; but, contrary to this opinion, which was entertained by some engineers, the cable has been satisfactorily worked in its normal condition during the last fourteen years. Lately, however, some of the conducting wires have proved faulty, and the directors, under the advice of their engineer, Mr. Bourdeaux, have thought it expedient to insert twenty miles of entirely new cable, which has greatly improved its insulation and conductivity. The cost of the twenty miles of new cable has been paid for out of the money due to the company and recently received from the Post-office. It is satisfactory to be able to state that during the past half-year the accidents to the company's cables, and the

consequent cost of the ordinary repairs, have been less than usual. Notwithstanding the continued dulness in trade, the receipts of the company have exceeded those of the corresponding six months of 1873, and enable the directors to recommend a dividend for the half-year ending the 31st December, 1874, at the rate of 16½ per cent. per annum, and add £2,287 to the reserve fund.

## TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY.

The report states that the accounts for the year show a net profit of £371,381, to which is added £19,359 brought from last year's account, making a total divisible profit of £390,741. Of this £22,410 has been appropriated to the payment of an interim dividend of 5 per cent. on the capital of the company, leaving £368,331 to be dealt with. Of this sum the directors propose to distribute as dividend in cash £87,230, being at the rate of £1 16s. per share or 15 per cent., and making with the amount already paid, a total dividend of 20 per cent. in cash, free of income tax. The directors further propose to distribute £186,750, being £5 per share represented by fully paid-up shares in the Brazilian Telegraph Company and ordinary shares of the Globe Telegraph Company, making a total distribution of £276,390 in cash and securities for the year, carrying forward to the next account a balance of £114,351. During the year 1874 the following works were carried out: The West India and Panama Company's cable between the islands of Dominica and Martinique was renewed, and that between St. Vincent and Barbos repaired; repairs were also effected in various portions of the cable between Santiago de Cuba and Cienfuegos, in the island of Cuba. The first section of the Brazilian cable between Lisbon and Maderia was repaired, the two ends having been recovered from depths of 2,400 fathoms, and a length of about sixty miles of cable spliced in the center. The second and third sections of the Brazilian cable connecting Madeira with Cape de Verde, and the Cape de Verdes with Pernambuco, amounting to 3,042 nautical miles, were successfully laid. The company, assisted by Mr. W. T. Henley, of North Woolwich, connected Constantinople with Odessa, in the Black Sea, by a cable 350 miles in length. The contract entered into early in the year with the Anglo-American Company for the manufacture of 1,100 miles of cable and for laying the same, together with 900 miles belonging to that company, from Newfoundland to Ireland, was successfully carried out, thus completing the fifth cable laid across the Atlantic by this company. The total length of cables actually laid by the company during the year 1874 was 5,973 nautical miles, and the directors feel a satisfaction in informing the shareholders that, in these operations, some of them of unprecedented magnitude in submarine cable-laying, not a single mishap occurred. The steps taken by the company, alluded to in the last annual report, for extending the system of submarine telegraphy along the West Coast of South America, were retarded through unavoidable delay in carrying out the necessary negotiations with the Government of the United States of Columbia, but the directors have reason to believe the arrangements will be soon satisfactorily concluded. The company's factories continue to be in thorough working order. Sir Daniel Gooch and Sir Thomas Fairbairn were re-elected directors, and Mr. John Ball and Mr. John Gane auditors of the company.

## A SUCCESSFUL ENTERPRISE.

The Telegraph Construction and Maintenance Company is, probably, the most successful business enterprise which has ever existed. It has been in operation about ten years, and has during that time repaid back to the proprietors four times the amount of the capital invested. Just now the company is in a quandary as to what should be done with the profits on hand, and yet undistributed. In an article referring to the company *The Railway News* of London remarks:

"We are glad to see that the directors of this company did not act upon the very bad advice which was given to them of applying the large profits which the company have made during the past year to the liquidation of its capital. The inconveniences, to say nothing of the doubtful character, in a legal point of view, of such a course, have already been explained in our columns. We hear that the profits in hand would have been sufficient to pay off the whole of the remaining capital of the company. A distribution equal in amount to nearly one half of the existing capital of the company has now been made, but by distributing it as dividend this capital is still left intact. The dividend declared is 36s. per share, and a certificate of £5, represented in about equal proportions by ordinary shares of the Globe Trust and the Brazilian Submarine Telegraph, and it is reported that the company have still a very large amount in reserve. The whole range of industrial enterprise cannot produce an instance of success equal to that which has attended the operations of this company. From its first establishment, now ten years since, the company has distributed, in the shape of dividends and bonuses, a total sum of £1,368,174. The capital, in fact, has been repaid back to the proprietors four times over in the space of ten years, and the company still retains a manufacturing establishment of first-class character, and an amount of stock and materials the value of which far exceeds the remaining amount of the capital.

The shareholders of this company owe much of the success of their undertaking to the practical experience which Sir Daniel Gooch, the chairman of the Great Western, has brought to bear in the management of its affairs. Thanks to the able supervision which has been shown, the company has not failed in any one of its undertakings for which it has contracted, while its competitors have been subject to many severe disappointments and have incurred many heavy losses. Comparisons are proverbially odious; but when we see how severe has been the disappointment, and how numerous the blunders, in connection with the attempt to satisfy the "great want of the age," by laying the so-called Direct United States Cable, how interminable is the litigation arising out of the attempts to complete the West Indian system of cables, and how serious have been the losses in connection with the La Plata cable, it would be ungenerous not to recognize the value of that practical experience which, in the management of the affairs of the Telegraph Construction and Maintenance Company, has enabled that company to attain to its present position, and secure for it practically the whole of the business connected with the manufacture of ocean cables in all parts of the world.

THE Union Steamship Company's steamships *Asiatic*, *African*, and *Anglican*, sailing from Plymouth, England, on the 6th, 16th, and 26th of the month, respectively, will touch at Madeira on the outward voyage, for the purpose of receiving on board telegraph messages addressed to places in Cape Colony.

## THE ANGLO-AMERICAN TELEGRAPH.

It would be greatly to the interests of the proprietors of this company if the administration of its affairs were made to conform more closely to the system adopted in the management of railways. There can be no reason, for instance, why the receipts of this company should not, as in the case of other submarine companies, be published periodically. The notion that doing so would tend to encourage competition is surely not entitled to much weight. It can make no difference whether the directors state at the end of the twelve months that their receipts have been £700,000 for the year, or that they state each month that they have been more or less £80,000. If such a statement had been made—and we put this merely by way of illustration, not knowing exactly what have been the receipts of this company—the proprietors would not have been alarmed at an announcement made a few days since by the directors that they did not mean to pay any more dividend than the amounts already paid *ad interim*. The four dividends which have been paid have amounted together to 5 per cent., which, upon the capital of the company, would represent only £350,000. As it is perfectly well known that the working charges do not exceed £70,000 a year, and assuming that the gross receipts were the same as last year—say £700,000, it would be quite clear that the balance available for dividend would be not £350,000 but £630,000. If the directors had decided that they would not divide more than 5 per cent., or about two-thirds of the earnings, we are quite certain that the proprietors would support them in that decision if they believed that the balance was to be applied for the purpose of strengthening the financial position of the company. The directors, however, go out of their way to make a “curt” announcement that they will not pay more than 5 per cent., without adding, as they might fairly and truly have done, that the balance had been applied towards completing the cost of laying the last cable, the purchase of the new “repairing ship,” or adding to the reserve of the company. If it was considered necessary to adopt the unusual mode of making the announcement through the daily papers rather than to the proprietors direct, there surely could have been no reason for creating a sort of semi-panic in the market, and frightening proprietors out of their stock, by withholding, as they did, the reasons which had induced them to divide only 5 per cent., when the earnings of the company would probably have justified the payment of 7 or 8 per cent. The proprietors were told that the meeting would be held in April, but that is a long time for a nervous proprietor to remain without information as to the reasons why so small a dividend was declared. And there are many persons who, better informed of the real state of the case, would be only too glad to work upon their fears for the purpose of inducing them to part with their stock at prices much below its real value.

A further cause of depression in the stock during the past week has been the announcement that a bill has been introduced into the Canadian Parliament for regulating marine telegraphs, and it is stated in the telegrams from New York that the bill is the same as that introduced last year with the object of confiscating the rights and privileges of the Anglo-American Company. We have reason to believe that the bill is not identical with that of last year, but that it will be found that the objection which Lord Carnarvon pointed out in the bill then sent over for approval has to a great extent been removed, and that whatever may be the provisions of the bill,

existing rights will be protected with that jealousy which has ever marked the legislation of this country, and which the Government of Canada cannot, and for its own credit and reputation will not, disregard.—*The Railway News*.

**HOOPER'S TELEGRAPH WORKS.**—The directors state that, after deducting £10,000 for depreciation of plant and machinery, and £15,000 for depreciation of the two ships *Hooper* and *Great Northern*, there is a profit of £84,308, or, after payment of the sum due to Mr. Hooper, an available balance of £51,529. A dividend of 15s. per share was paid in July last, and another of £1 per share is now recommended (being at the rate of 17½ per cent. per annum), leaving £7,779 to be added to the reserve fund, which is thereby increased to £35,231.

The Eastern Telegraph Company have just opened a new route to Egypt, across France, *via* Marseilles and Malta. They have leased a special wire for this purpose from the French Government.

The telegraph cable between England and Guernsey was repaired on 7th February.

The telegraph cable between Lizard, Cornwall, and Santander, in Spain, is broken, and the *Caroline*, one of Mr. Henley's ships, which is on the spot, was about to repair it.

The number of messages transmitted from postal telegraph stations in the United Kingdom for the week ended February 6, 1875, was 342,892—a decrease on the corresponding week of 1874 of 24,284.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 13th of February, was 342,197, and during the week ended February 14, 1874, 352,426; showing a decrease in the week of 1875 on that of 1874 of 10,229. The high number of telegrams during the corresponding week of 1874 was owing to the General Election.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 20th of February, 1875, was 347,108, and during the week ended February 21, 1874, 326,496; showing an increase in the week of 1875 on that of 1874 of 20,612.

The traffic receipts for messages by the Direct Spanish Telegraph for the month of January last amounted to £1,654, against £1,271 for messages in December last.

The receipts of the Submarine Telegraph Company for the month of January amounted to £8,573, and for the corresponding month of the preceding year to £8,706.

The cable steamer “Sydney Hall,” with the extra cable and the electrical staff on board for the completion of the circuits of the Montevidean and Brazilian Company, in conjunction with those of the Platino Company, has left North Woolwich for the River Plate.

The fourth international Telegraph Conference is to be opened at St. Petersburg, as has been already announced, on the 1st of June next. Of the twenty-four Governments who have joined the convention all have already signified their intention to attend. Twenty cable companies have likewise accepted. From the United States Telegraph Companies no reply had been received a few days ago. Of States not hitherto represented three have been asked. Of these, Brazil has definitively accepted, and favorable replies are anticipated from Japan and the River Plate States.

**ON MAGNETIC CONDENSATION IN SOFT IRON.—A Lallemand.**—Magnetic condensation, first discovered by M. Jamin, in steel, takes place also in soft iron with a very remarkable strength and persistence. Let a horseshoe electro-magnet be formed of an iron cylinder, 4 c. m. in diameter, and round each branch let a wire spiral, 2 m.m. in diameter, and 150 m. long, be wound; the armature to be a plate of soft iron, 2 c. m. thick and 4 c. m. wide. When the double helix is traversed by a current from a single Bunsen element, feebly charged, about 150 kilos. may be supported: on breaking the circuit 50 kilos. may still be supported; but, after the armature is detached, all trace of magnetism disappears, and the electro-magnet will not even attract its armature.

Cohesion in no way causes the adhesion of the armature after suppression of the current, for no cohesion is manifested under a pressure greater than that afforded by the magnetism. Besides, a magnetised needle placed in the vicinity of one of the polar faces experiences a strong deflection, which disappears immediately after contact has been broken. In order to measure the quantity of magnetism condensed in the neighborhood of the poles (under the influence of the armature), and to compare it with the small proportion of remanent magnetism preserved by the electro-magnet, I put the wire in connection with a Weber's galvanometer. The battery current having first circulated in the electro-magnet and determined the adhesion of contact, and the communication with the galvanometer being secured by means of a derivation, I detached the armature by sliding it away; the induced current developed gave the number 182. After some minutes the armature was replaced, and again detached in the same manner; the induced current numbered 5.5, and was a measure of the remanent magnetism. Thus the condensed magnetism was about thirty-three times as great as the remanent magnetism. But this relation is variable, depending on the strength of the current, dimensions, and form of the contact-piece, and nature of the iron of which the magnet is formed. The persistence of the condensed magnetism is most remarkable, for after twenty days the magnet continued to support 50 kilos., and on then detaching the armature the same value, 182, was given.

**RESULTS PRODUCED BY THE JOINT ACTION OF A BATTERY AND OF ELECTRO-CAPILLARY CURRENTS.—M. BECQUEREL.**—The author has investigated the possibility of augmenting or decreasing the intensity of electro-capillary action by the aid of the current of a battery of several elements. Among the bodies experimented upon was the chloride of chrome, which yielded an intense black deposit. This was found to be a hydrated sesquioxide of chrome; the black color is due to some peculiar molecular arrangement, and the crystallization belongs to the regular system. Perchloride of iron yielded also a black, crystalline deposit consisting of hydrated sesquisulphide. Chloride of bismuth also deposited the sulphide of the metal. Acetate of lead deposited metallic lead in a very brilliant state. Nitrate of copper yielded a brilliant deposit of metallic copper on the negative surface and crystalline sulphide of copper on the other. With the chlorides of gold and of zinc no decomposition was produced. The apparatus consisted of a split tube containing the solution to be experimented upon, and plunged in a larger tube containing a solution of an alkaline sulphide. The action was augmented by means of two slips of platinum in connection with a battery, the positive being immersed in the metallic solution and the negative in the sulphide.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, March 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Cooper, Ala., closed.  
Oxmoor, Ala., closed.  
Forks of Clear Creek, Cal., closed.  
Hogansville, Ga., closed.  
Farndale, Ill., closed.  
Business for Foreman Sta., Ill., (office closed August 1st, 1874.) should be sent and checked to Vienna.  
Messages taken for the Ill. Industrial University, near Champaign, Ill., are delivered from Champaign. Charges for delivery 25 cts.  
The P. O. address of Summit, Van Buren Co., Iowa, is Mount Zion.  
Messages for Newport Barracks, Ky., are sometimes erroneously addressed to Covington. They should be addressed and sent to Newport, Ky.  
Messages taken for Brewer and Brewer Village, Me., are delivered from Bangor. Charges for delivery twenty-five cents and one dollar, respectively.  
Waverton, Md., reopened.  
The following changes in the rates for other lines from Detroit, Lansing and Ionia, Mich., have been made:

To	From	
	Detroit.	Lansing. Ionia.
Brighton, Mich.,	30	30
Coral, "	—	30
Fisher's, "	25	—
Fowlerville, Mich.,	40	25
Grand Ledge, "	—	25
Greenville, "	—	25
Gowen, "	—	30
Howell, "	40	30
Leroy, Ingham Co., Mich.,	40	25
Lyons, "	—	30
Maple Valley, "	—	30
Okemos, "	40	25
Portland, "	—	25
South Lyons, "	30	40
Trufants, "	—	30
Williamston, "	40	25

Hereafter the "tariff for other lines" to Howard, Montcalm Co., Mich., via Ionia, will be 30 and 2.

Messages taken for the Quarantine Hospital, near Jefferson Barracks, Mo., are delivered from Jefferson Barracks. Charges for delivery 50 cents.

Fort McPherson, Neb., reopened, square 326, check direct.  
Squan, N. J., reopened, check Freehold.

Tremont, N. Y., reopened, W. U. office, square 41, check Morrisania.

Hillsboro, N. C., reopened, square 115, check direct.  
Dexter City, O., closed.

Glenwood, O., closed.  
Farran's Point, Ont., closed.

Spring Creek, Pa., reopened.  
Troy, Pa., square 93, and printed in Tariff Book, is in Bradford Co.

Messages for Larabee's, Pa., (at present sent via Buffalo, N. Y.), may also be sent via Smethport, Pa., "tariff for other lines" 25 and 2.

Hadlow Cove, Que., closed.  
Hereafter the "tariff for other lines" from Columbia to Greenville, S. C., will be 40 and 2.

Early Branch, S. C., closed.  
Lindale, Texas, closed.

\* Lanark, Texas, reopened; "tariff for other lines" same as to Atlanta.

## NEW OFFICES.

397 West Grove, Iowa.  
269 Nunica Junc., Mich.  
130 Markhams, N. Y.  
41 Port Morris, N. Y., check Morrisania.  
\* Balmoral, G. T. R., Ont.  
\* Clearmont, Pa., 25 2 from Smethport.  
131 Du Bois, Pa.  
\* Hamlin, Pa., 25 2 from Smethport.  
131 Troy, Jefferson Co., Pa.

Offices recently furnished with "Special Sheet E" will use their special rate to Lambertville, N. J., on messages to and from New Hope, Pa. The latter office should be added to the list of names given on "Sheet E."

## ATLANTIC CABLE BUSINESS.

We are notified that the cable communication "Via Santander" is re-established.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
NEW YORK, March 10, 1875.

On April 1st, Trenton, N. J., will be added to the list of offices specially authorized.

GEO. H. MUMFORD, Vice-Prest.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, March 15, 1875.

Executive Order No. 162.

Rule 35 is hereby amended as follows:

No person, not employed therein, will be allowed to enter an Operating Room of the Company except by express permission of the Manager of the Office, or of a Superintendent or other superior officer of the Company. Managers are not expected to give such permission except to employes in their own offices whose duties require their presence in the Operating Room.

WILLIAM ORTON, Pres't.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

NEW YORK, March 10, 1875.

## ASSESSMENT No. 73.

2, 4, 16, 21, 23, 33, 54, 59, 60, 64, 65, 67, 77, 80, 82, 86, 88, 90, 91, 95, 98, 113, 121, 131, 138, 145, 146, 157, 176, 177, 179, 181, 188, 201, 202, 208, 211, 215, 217, 220, 235, 245, 254, 269, 274, 276, 277, 280, 286, 289, 301, 302, 312, 342, 344, 346, 349, 351, 352, 367, 368, 385, 398, 402, 405, 412, 418, 434, 447, 464, 467, 509, 510, 532, 536, 545, 547, 549, 553, 554, 564, 576, 585, 587, 592, 594, 603, 604, 615, 622, 626, 655, 662, 663, 664, 665, 669, 672, 685, 715, 721, 731, 740, 743, 787, 799, 815, 821, 830, 832, 842, 843, 858, 859, 873, 880, 886, 913, 916, 917, 923, 932, 941, 978, 1000, 1013, 1023, 1024, 1033, 1039, 1054, 1104, 1126, 1127, 1143, 1144, 1147, 1154, 1159, 1173, 1175, 1178, 1182, 1183, 1199, 1208, 1232, 1252, 1255, 1260, 1267, 1276, 1282, 1298, 1300, 1304, 1306, 1325, 1329, 1333, 1345, 1357, 1364, 1365, 1368, 1394, 1402, 1403, 1404, 1409, 1410, 1440, 1484, 1485, 1489, 1516, 1517, 1518, 1532, 1550, 1554, 1555, 1568, 1569, 1571, 1573, 1590, 1593, 1594, 1615, 1619, 1623, 1630, 1635, 1652, 1658, 1684, 1687, 1688, 1695, 1708, 1709, 1710, 1713, 1724, 1735, 1745, 1790, 1811, 1812, 1815, 1831, 1839, 1840, 1841, 1852, 1863, 1894, 1901, 1906, 1919, 1943, 1944, 1950, 1965, 1970, 1998, 2019, 2021, 2026, 2027, 2028, 2030, 2038, 2040, 2041, 2044, 2049, 2057, 2066, 2069, 2073, 2082, 2084, 2097, 2119, 2135, 2138, 2150, 2153, 2164, 2172, 2174, 2178, 2180, 2183, 2184, 2185, 2199, 2208, 2204, 2205, 2206, 2212, 2213, 2214, 2221, 2228, 2229, 2233, 2234, 2240, 2241, 2242, 2243, 2244, 2254, 2257, 2259, 2273, 2287, 2289, 2290, 2310, 2312, 2322, 2330, 2331, 2333, 2334, 2335, 2336, 2337, 2338, 2340, 2341, 2342, 2343, 2344, 2345, 2347, 2350, 2354, 2355, 2356, 2360, 2379, 2387, 2388, 2390, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411.

## ASSESSMENT No. 72.

8, 20, 555, 2220, 2275, 2276, 2277, 2280, 2285, 2286, 2290, 2305, 2311, 2307, 2368, 2371, 2375, 2376, 2377, 2378, 2380, 2381, 2382, 2383, 2384, 2385, 2386.

## ASSESSMENT No. 71.

6, 175, 178, 273, 294, 319, 347, 597, 692, 766, 1134, 1135, 1136, 1139, 1265, 1511, 1673, 1722, 1727, 1778, 1854, 1921, 1994, 2063, 2122.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

JANUARY, 1875.

## APPOINTMENTS.

W. L. Lewis, Broadway & Dey street.  
L. Nigier, Broadway & Dey st.  
S. C. Osborne, "  
H. J. Brower, 516 Broadway.  
R. L. Ballard, 50 Pine street.  
E. J. Curran, 14 Broad street.  
Wm. Farron, St. Nicholas Hotel.  
G. H. Getz, 14 Broad street.  
Wm. Talcott, 50 Pine street.  
W. L. Van Harlinger, Clafin's, N. Y.  
F. Bunce, Round Lake, N. Y.  
G. O. Glazey, Carmel, N. Y.  
Geo. Dunham, Glens Falls, N. Y.  
A. Lohnes, Valley Falls, N. Y.  
H. B. McFarland, Hunters Point, N. Y.  
J. M. Sykes, Sandy Hook, N. J.  
Mrs. H. M. Chapman, Boston, Mass.  
Mrs. L. M. Birdalee, Boston, Mass.  
W. B. Wilde, Duxbury, Mass.  
Wm. Welch, Providence, R. I.  
Miss K. B. Ramsey, Lynn, Mass.  
J. H. Arnott, Binghamton, N. Y.  
T. L. Clinton, Baltimore, Md.  
A. R. V. Hull, "  
C. H. Wambold, Coopersburg, Pa.  
C. H. Algert, East Pa. Junc., Pa.  
C. B. Melot, Fleetwood, Pa.  
J. McCabe, Gardner Switch, Pa.  
J. Richards, Jersey City, N. J.  
W. N. McIrvine, Kingston, Pa.  
E. C. Stevens, Neshauc, N. J.  
F. C. Canly, Ralston, Pa.  
J. C. Janes, Roselle, N. J.  
F. Weed, Trout Run, Pa.  
J. R. Mills, Trenton, N. J.  
J. Connor, Washington, D. C.  
J. N. Kates, Wilmington, Del.  
G. W. Metcalf, Rutland, Vt.  
C. E. Field, So. Ashburnham, Mass.  
L. R. Hubbell, West Charlotte, Vt.  
C. M. Smith, Buckhannon, Pa.  
L. H. Dayton, Ft. Benton, Mon.  
C. W. Almey, Grand Island, Neb.  
J. A. Van Winkle, Hilliard, W. Va.  
H. C. Craig, Clarion, Pa.  
F. P. Thompson, Millerstown, Pa.  
W. B. Ogden, Oil City, Pa.  
T. Egan, Parker's Landing, Pa.  
H. M. Russell, Petrolia, Pa.  
H. L. Fitch, Wheeling, W. Va.  
W. Chittle, Mattoon, Ill.  
C. H. Hotchkiss, Richmond, Ill.  
F. F. McLellan, Huntington, W. Va.  
W. Gregg, Morristown, O.  
W. C. Wesson, Portsmouth, O.  
T. Donahue, Vincennes, Ind.  
O. B. Vincent, Zanesville, O.  
J. C. Irvin, Jefferson City, Mo.  
R. Livingston, Kansas City, "  
T. W. Singer, Sedalia, "  
J. A. Sponsie, Topeka, Ka.  
W. F. Drake, Wadita, "  
C. Berry, St. Louis, Mo.  
E. S. Guignon, "  
W. M. Herrington, Atchison, Ka.  
E. H. Chase, Buffalo, N. Y.  
D. C. Shull, Cleveland, O.  
J. T. Hanford, "  
A. H. Dane, Lansing, Mich.  
T. Winsor, Port Austin, "  
T. H. Bradley, Alexandria, Va.  
S. Green, Durham, N. C.  
W. S. Haymond, Goldsboro, N. C.  
J. R. McHugh, Henderson, N. C.  
George Barnes, Monroe, N. C.  
C. R. Morton, Norfolk, Va.  
M. T. Kendall, Polkton, N. C.  
C. W. Trice, Thomasville, "  
J. H. Gilkeson, Louisville, Ky.  
C. Howard, Bardstow Jc., "  
J. H. Simmons, Fulton, "  
W. A. Gulp, Lebanon, "  
N. McLean, Danville, Tenn.  
E. Coleman, Milan, "  
James Fraser, Rutherford, "  
S. J. Arnold, Johnsonville, Tenn.  
B. A. Long, Nortonville, Tenn.  
P. F. Dunne, Augusta, Ga.  
S. B. Fielding, Varnesville, S. C.  
J. T. Cooper, Coopers, Ala.  
J. B. Wiley, Greensboro, N. C.  
W. D. Hatch, Newberne, "  
J. M. Shivers, Scotts Stat., "  
Mrs. R. F. Flournoy, Priors Station, Ga.  
R. A. Paschal, Geneva, Ga.  
W. Schieble, Waynesboro, Miss.  
J. R. Huggins, Enterprise, Miss.  
H. C. Hawkins, Brooksville, "  
J. F. Heustee, Beauregard, "  
Geo. Lennox, Kenner, La.  
J. T. McHugh, New Or., "  
N. A. Edwards, Varden, Miss.  
F. Burnett, Columbus, Tex.  
L. C. Moore, Englewood, "  
J. P. Mann, Ennis, "  
G. Anderson, Flatonia, "  
E. Altemus, Little Rock, Ark.  
J. C. DeLong, "  
F. G. Ungles, Oakwood, Tex.

## RESIGNATIONS.

P. V. DeGraw, Broadway & Dey  
T. G. Bishop, "  
E. C. Boileau, "  
F. N. Bassett, "  
W. H. Hargrave, "  
Kate Marrott, "  
Sarah Litzensatter, "  
H. P. Jones, "  
T. T. Eckert, "  
A. B. Chandler, "  
M. B. Cottrell, 14 Broad street.  
B. DeKlyn, Cotton Exchange.  
M. Erwin, Clafin's "  
M. Kennedy, 50 Pine street.  
Eliza Klampton, Cooper Union.  
S. H. Moore, Hunter's Point.  
J. Litzensatter, 791 Broadway.  
W. D. La Motte, Quarantine, S. I.  
Belle Lane, Carmel, N. Y.  
Lizzie Noble, Wmaburg, N. Y.  
E. Putnam, Glen's Falls, "  
L. Palmer, Valley Falls, "  
A. B. Clarke, Buckhannon, Pa.  
T. O. Kord, Keyser, Pa.  
H. H. Miller, Blue Ridge, Va.  
Miss M. L. Bampus, Boston, Mass.  
E. S. Risdon, Duxbury, Mass.  
J. Schull, Binghamton, N. Y.  
A. Triers, Franklin, Pa.  
E. N. Goodhart, Washington, D. C.  
T. P. Nolan, Washington, D. C.  
F. M. Fisher, Adamsburg, Pa.  
G. F. Croswalsh, Beavertown, Pa.  
Ed. Radigan, Baltimore, Md.  
E. L. McNett, Carpenters, Pa.  
F. Chauncy, Gillette, "  
J. J. Kress, Wilmington, Del.  
A. Connor, Portland, Vt.  
E. A. Blake, South Ashburnham, Mass.  
W. M. Corbett, St. Albans, Vt.  
Mrs. M. C. Pope, West Charlotte, Vt.  
J. H. Jenkins, Grand Island, Neb.  
Miss A. Grier, Clarion, Pa.  
J. F. Robinson, Leechburg, Pa.  
H. L. Fitch, Oil City, "  
T. P. Thompson, Petrolia, "  
C. E. Cloud, Wheeling, W. Va.  
T. Egan, Pittsburgh, Pa.  
A. Pope, Mattoon, Ill.  
O. B. Vincent, Cincinnati, O.  
G. E. Cheney, "  
M. C. Wesson, Huntington, W. Va.  
T. H. Towns, Portsmouth, O.  
W. J. Lewis, Vincennes, Ind.  
J. D. Hoge, Zanesville, O.  
J. De Long, Kansas City, Mo.  
J. McCabe, Sedalia, Mo.  
J. H. Powers, Topeka, Ka.  
J. Mahoney, Wadita, "  
F. R. Truain, St. Louis, Mo.  
A. A. Haquette, "  
K. A. Henry, Buffalo, N. Y.  
T. Lowe, Cleveland, O.  
E. R. Williams, Goldsboro, N. C.  
W. F. Holloway, Norfolk, Va.  
J. J. Cheney, Norfolk, Va.  
J. Maness, Polkton, N. C.  
J. G. Cooley, Thomasville, "  
N. C.  
S. L. Chamber, Bardstown Jc., Ky.

W. G. Wilson, Harrisburg, Pa.  
 B. Donnelly, Gardner Switch, Pa.  
 W. B. Fowler, Kingston, Pa.  
 T. J. Bradder, East Pa. Junction, Pa.  
 D. H. Woods, Middleburg, Pa.  
 F. W. Erhart, McClure, Pa.  
 Miss M. R. Fieh, Neshauc, N. J.  
 J. G. Mendenhall, Painter, Pa.  
 W. N. Gove, Philadelphia, Pa.  
 H. A. Wells, " "  
 W. G. Jones, " "  
 D. C. Blair, Ralston, Pa.  
 T. P. Rockwell, Roaring Branch, Pa.  
 Miss C. Minger, Roselle, N. J.  
 C. F. Kissenger, Trout Run, Pa.

W. W. Irvin, Fulton, Ky.  
 J. H. Gilkeson, Lebanon, Ky.  
 P. E. Pelot, Danville, Tenn.  
 A. Nance, Rutherford, " "  
 J. Ward, Johnsonville, " "  
 A. T. Butler, Nortonville, " "  
 H. D. Nouell, Augusta, Ga.  
 A. B. Coburn, Vainesville, S. C.  
 G. W. Roland, Geneva, Ga.  
 C. D. Thompson, Waynesboro, Miss.  
 M. W. Ridus, Enterprise, Miss.  
 J. H. Huggins, Brooksville, Miss.  
 W. T. Carter, Beauregard, Miss.  
 J. P. Gilloly, Kenner, La.  
 S. Eisey, Varden, Miss.

## TRANSFERS.

Name.	From.	To.
H. E. Adams	Broadway and Dey	Duane street.
A. M. Darland	"	Williamsburg.
Miss A. R. Eaton	Cooper Union	Astor Place
J. D. Hashegan	Horse Shoe, N. J.	Quarantine.
L. F. Klefer	Board Brokers	516 Broadway.
M. E. Morley	St. James Hotel	Broadway and Dey
M. L. Rosman	Duane st.	Cooper Union.
Miss E. K. Searles	Astor Place	St. James Hotel.
R. Tinney	Coopersburg	North Wales.
J. A. Hennebery	Washington	Phil., Pa.
H. S. Rady	Alexandria	Wilmington, N. C.
C. W. Trice	Durham, N. C.	Thomasville, Pa.
J. W. Crews	Greenbrier, W. S. Sps.	Lynchburg, Va.
B. W. Lee	Henderson, N. C.	G. W. S. Springs.
M. T. Kendall	Monroe, N. C.	Polkton, N. C.
N. C. Pamplin	Richmond, Va.	Norfolk, Va.
H. F. Lines	Wilmington, N. C.	Richmond, Va.
J. W. Phillips	Savannah, Ga.	Charleston, S. C.
M. S. Harris	Charleston, S. C.	Savannah.
J. L. Hussey	Berzella, Ga.	Harlem, Ga.

## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

One day this week I was talking with the manager of a small Western Union office in Northern New Jersey, and we got in a dispute about the ground wire, and have agreed to refer the matter to you for a decision. He claimed that the electricity passed through the ground from the end of the ground wire, at one end of the line, to the end of the ground wire, at the other end of the line, taking the same course of, and running directly under the wire as it is strung on the poles, and forming the circuit in exactly the same way as the second wire does. Now, I claim that the electricity passes from the ground wire off into the earth, and is immediately lost from any farther effect on the line, thus giving room for more as fast as it can be made by the batteries. Now, if you will please be so kind as to give us a little light through the JOURNAL, you will confer a great favor upon

A STUDENT.

*Answer.*—This is a question still in dispute. Pretty much all we know about the matter is that when the two ends of a long wire are connected to an earth conductor having no resistance, it is the same thing in effect as connecting the two ends of the wire together, so far as the passage of the current is concerned, but how this conduction is brought about—whether by the earth's acting as a reservoir, the positive current running into it at one end and out of it at the other—or as a sponge which sucks up the + E at one end of the wire, and the — E at the other, or as a huge conductor, having no resistance, we don't know, and we imagine it is one of those things which "no feller will ever find out," and as it is not of the slightest consequence any way, we suggest that students had much better employ their time in acquiring a knowledge of the established facts in relation to electricity than to waste it in unprofitable discussions upon hypothetical propositions impossible of being solved.

VIENNA, IND., Feb. 26th, 1875.

To the Editor of the Journal of the Telegraph:

Having had an argument in regard to the following question, it was agreed to submit to your an-

swer. Suppose we have a complete circuit, and have two offices at equal distances on the line. If we place a ground wire just outside of each office on both wires, will the instruments work, or the ground wires carry the current to the ground? By answering this in JOURNAL, you will oblige me. M.

*Answer.*—By a "complete circuit" we presume you mean a metallic circuit. In such a case, if you place the ground wire at each office between the battery and the instrument, neither instrument will work. If placed on the other side of the instrument in each office, the instruments will work as at first, the ground forming part of the circuit.

To the Editor of the Journal of the Telegraph:

Can less than twenty-five cents be charged for answer of ten words from Manager where the signal "34" is used, as spoken of in Rule 13, in case the rate is less than fifty cents?

If message received collect from offices in Nevada, &c., are answers, are they to be checked at the rate of \$2.75 and 18?

*Answer.*—A reply sent by the manager of an office under rule 13 [is to be charged for at one-half the usual rate. Thus, if the rate is thirty cents, the reply, if it contains ten words or less, would be fifteen cents. If there were more than ten words in the reply, each additional word would be one-half of the rate charged for additional words under the full tariff.

All messages received collect from points in the Pacific Division are to be checked at the rate of \$2.75 and 18, as provided for in the Tariff Circular of February 1st, 1873.

FREEMPORT, ILL., February 12th, 1875.

To the Editor of the Journal of the Telegraph:

1. Are half-rate messages covered by Rule 13? If so, are we to make the additional charge only half of the night rate?

2. Suppose a message is received, paid at Government rates, for a party not in Government employ. He tenders answer, for which he refuses to pay, the original message being strictly on Government business and calling for the answer. Should such answer be sent "Collect full rates," "Collect Government rates," or prepaid Government rates, and sent in as voucher? Please answer through columns of the JOURNAL, and oblige

J. H. STEARNS, Manager.

*Answer.*—1. Rule 13 applies to half-rate business as well as to full rate, but the additional charge should be "one-half the usual rate," which is the day rate. The transmission of the notice of delivery of a night message would be by day and to it day rates would apply.

2. The answer should be sent—Collect Government rate.

WELLSBURG, March 4th, 1875.

To the Editor of the Journal of the Telegraph:

Please inform me, through the JOURNAL, the name and mode of setting up the following battery:

A large circular zinc, the height of the jar, porous cup inside of zinc, and a bar the height of porous cup (looking very much like stone) inside of same. It is worked with acid instead of blue vitriol.

OPERATOR.

*Answer.*—This battery is the Bunsen. The bar which looks like stone is carbon mixed with saccharine matter, subjected to great pressure and baked. To set it up, place the zinc in the jar and the porous

cup inside the zinc. Now put the carbon in the porous cup, and fill the cup with a solution of bi-chromate of potash, known to the trade as Electro-potash fluid. Next, fill the jar with a solution of one part sulphuric acid to twenty parts of water, and the battery will be in action. Care should be taken that no part of the acid solution enters the porous cup, and the zinc should be mercurialized before immersed in the acid solution. The Bunsen element is one of the most powerful voltaic batteries known.

PETROLIA, Pa., March 5, 1875.

To the Editor of the Journal of the Telegraph:

1st. Is there any advantage in having the cells of a Callaud Battery insulated? 2d. What is the best form of battery for working a bell circuit, worked on the open circuit plan, and how many cells would be necessary for a line two or three hundred feet long?

By answering, you will much oblige

A. C. BEESON.

*Answer.*—1st. Putting the jars on a dry board answers all purposes of insulation. 2d. The Léclanché or Smee's Battery are the best for this purpose. Use three of the former or six of the latter.

To the Editor of the Journal of the Telegraph:

I received a message to-day with 10 words in body, and at end of check, "Ans. paid here," was added. I contended that there was 13 words. The operator at repeating office said she was good authority, and that the sending office had the right to put those words in without payment. How is it?

C. D. S.

*Answer.*—Every word on the face of a message, except the date, address and signature, should be counted and charged for. In forwarded messages the date also should be counted. There is no authority competent to disregard a living rule of the Company.

## NAVAL SURVEY.

The United States steamer *Fortune*, Commander Green, was at Santiago de Cuba, Feb. 25, having arrived on the 16th, under instructions of the Navy Department, to make observations with the view of ascertaining the exact geographical position of all places in the West Indies connected by the submarine cable.

The Spanish Government has offered, and is giving Commander Green every facility and co-operation in carrying out the scientific work entrusted to him.

## BORN.

KEMP.—At Milford, Conn., Feb. 23, 1875, a daughter to L. D. Kemp, Manager W. U. Tel. Office.

RHODES.—At Urbana, Ohio, Feb. 13, 1875, a son to J. H. Rhodes, Manager W. U. Tel. Office.

## MARRIED.

JENKS—TEALL.—At Portsmouth, Mich., Feb. 23, 1875, by Rev. C. H. Fraser, Mr. J. C. Jenks, of Train Dispatching Department, F. and P. M. Ry., East Saginaw, to Miss Mary L. Teall, of Portsmouth, formerly of Jackson, Mich.

PEPPER—DABOLL.—At Springfield, Mass., March 2, 1875, by Rev. Geo. E. Merrill, Herbert M. Pepper, of W. U. Tel. Co., to Miss Sadie A. Daboll.

## DIED.

MILNER.—At Williamsburg, L. I., on Monday, March 1, 1875, Austin Abbot, infant son of Thomas M. and Anna L. Milner, aged 1 month and 6 days.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

### TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, MARCH 15, 1875.

### THE QUARTERLY DIVIDEND.

At the Meeting of the Board of Directors of the Western Union Telegraph Company held on Wednesday, March 10th, the regular quarterly dividend of two per cent. was declared, payable on and after April 15th. The transfer books will be closed on March 20th, and will open April 16th.

THE attention of Superintendents and Managers is particularly directed to the Executive Order No. 161, which appeared in the last issue of the JOURNAL.

Under the provisions of this order half-rate messages may now be received from the public without prepayment, but care must be taken when such messages are offered that the amount of tolls thereon is guaranteed by some person of responsibility.

Executive Order No. 163, amending Rule 35, will be found on page 86.

Among the latest measures adopted by Congress was an Act authorizing the creation of a new fire alarm telegraph for the cities of Washington and Georgetown, at a cost not to exceed \$75,000, one-half to be paid out of the treasury of the District of Columbia and the other out of the National Treasury.

### THE CANADIAN TELEGRAPH BILL.

It seems more than probable that the McKenzie bill regulating the construction and maintenance of marine electric telegraphs, now pending in the lower House of the Dominion Parliament, will, if passed by that body, be thrown out by the Senate. Considerable opposition is already manifested in the latter body against the measure, which is calculated to deprive the Anglo-American Cable Company of its chartered rights and privileges.

### IGNOMINIOUSLY DISMISSED.

It is with no ordinary feeling of pain that we chronicle the ignominious dismissal, after years of faithful labor, which had brought to him honorable promotion, of J. Frank Morrison, night manager of the Baltimore office of the Western Union Telegraph Company.

The facts are as follows:

On March 1st, 3d and 4th, certain telegrams between the Presidents of the Erie and Baltimore and Ohio Railroad Companies passed over the wires of the Western Union Telegraph Company, between New York and Baltimore.

Night Manager Morrison had charge of these messages. He knew his duty well. He was an intelligent man, fully aware of his high trust. Yet, whether bribed thereto, or in temporary loss of the judgment and fidelity which had thus far distinguished him, he either placed or so arranged it that copies of this correspondence got into the hands of a newspaper reporter whom Morrison allowed the run of the operating department, and they were by that means published as special telegrams from New York.

Complaint being made, the Western Union Company instituted a rigid investigation, and the leak was traced directly to Morrison, who was at once discharged from the service, and is now awaiting trial under a charge of misdemeanor, which, under the laws of Maryland, is punishable by imprisonment for three months or a fine of five hundred dollars, in the discretion of the Court. The interest of the Company and its standing before the public demand that an example should be made of this violator of sacred trust, and the matter will be prosecuted to the fullest extent.

### THE CASE OF McCLELLAND.

McClelland, the telegraph operator who was convicted of criminal negligence by allowing two trains to collide at the Bergen Cut, thereby causing the loss of two lives, still lies in jail. The Court dealt leniently with him, imposing a fine of \$200 and the costs of the prosecution. This sum, however, he is unable to pay. The case has been discussed in the Board of Freeholders of Hudson County (N. J.), but no definite action was taken thereon.

### A CASE OF MISFORTUNE.

#### ADDITIONAL SUBSCRIPTIONS.

We have to acknowledge the receipt of the following additional subscriptions to this fund:

N. Y. Operators.	\$1 50	Portly John.....	\$5 50
W. C. L.....	1 00	Etta Brown.....	1 00
C. T. Huntington.	1 00	A. W. Kemp.....	1 00
Frank Haight....	1 00	B. McQuinn.....	1 00
Total.....			\$13 00
Previously acknowledged.....			415 50
Grand Total.....			\$428 50

### MILWAUKEE ELECTRICAL SOCIETY.

The Milwaukee Electrical Society, which was organized some three months since, has developed considerable local talent, and is receiving constant accessions to its ranks from Milwaukee and points contiguous. Already the members number thirty five, and there are a number of applications for membership pending. The two last regular meetings were very successful. At the first of these Mr. E. Shape, chief operator of the Western Union Department, gave a very interesting description of the Stearns Differential and the Bridge systems of duplex telegraphy. At the second meeting Mr. Wm. H. Kelsey, chief operator of the North Western Department, described and illustrated the Haskins duplex with much success.

These meetings are creating a healthy sentiment among the operators of that section, and stimulating a desire for increased knowledge in the telegraphic art, which cannot be too highly commended.

### DESTRUCTION OF THE ALBANY (N. Y.) OFFICE BY FIRE.

The Museum Building on Broadway, Albany, N. Y., in which was located the main office of the Western Union Telegraph Company, was totally destroyed by fire on the night of Friday, March 5th. The fire broke out about 10 o'clock, and made such quick progress that the operating force on duty had barely time to escape with their lives. The whole of the telegraphic apparatus was consumed.

Before the fire had fairly consummated its work, the Western Union authorities at New York were notified, and Saturday morning thirty sets of new instruments, with the necessary supplies, were on the way to Albany in charge of Supt. Brown and Assistant-Electrician Smith. Foreman Thompson and his assistants were early on hand. Saturday a new office was engaged, and on Sunday everything was in working order. The business of the Company meanwhile was transacted from the depot office.

### THE SAN FRANCISCO CITY TELEGRAPHS.

The Committee on Fire Alarm and Police Telegraph have reported to the Board of Supervisors of San Francisco, Cal., against the adoption of the proposition made to the city by the American District Telegraph Company, to take charge of and work the fire alarm system, for the reason that the City and County Attorney has decided that such a proposition could not be legally entertained.

Messrs. MORTON, ROSE & Co. of London announce that they are authorized to receive subscriptions to an issue of £1,030,000 six per cent. of sterling bonds, of £100 and £200 each, of the Western Union Telegraph Company of the United States. The price of issue is to be 87 if paid in full on allotment, or 87½ per cent. if paid in instalments, extending to the 26th of April next. The bonds are to be redeemed at par by the year 1900. This issue has been authorized for the purpose of providing means to redeem bonds of the Company maturing in the course of the present year, amounting to \$4,448,900, and to that extent does not increase the indebtedness of the Company.

## THE TELEGRAPH FIGHT.

The raid of Jay Gould, with the Atlantic and Pacific telegraph, upon the Western Union, has not realized any degree of its wild promises. The cutting of rates has apparently changed no business, or affected it any way. Western Union stock holds firmer prices than the other, and is rated nearly four times as valuable, while the Directors have just declared their usual quarterly dividend of 2 per cent. The resort to Congress for special legislation in aid of the speculation, which is one of the last inventions of Gould for affecting the stock market, met with a contemptible failure, though backed by the ablest "parliamentary lawyer" at Washington, and espoused on the floor, with his most arduous ardor, by Gen. Butler himself. Perhaps Gould will take up the case again as soon as he has had time to count up the profits of his Pacific Mail and Union Pacific campaigns. These have been notable triumphs, and he has found "millions in them." But his telegraph reconnaissance is a sad fiasco, and if he still undertakes to make a battle of it, it will probably prove a blunder. The great Western Union machine possibly needs overhauling for the popular benefit, but reforms in behalf of the public pocket have never yet found a brilliant champion in Jim Fisk's old partner.—*Springfield Republican*

## BUTLER'S BIG STOCK JOB.

## THE SECRET HISTORY OF THE TELEGRAPH BILL—A WALL STREET SCHEME.

[Washington Correspondence of the N. Y. Sun.]

The history of the recent attempt to pass what is known as the Telegraph Bill in the House has become well known here. It is nothing less than the history of a big stock speculation in Wall street, at the head of which stood Jay Gould. The scheme proposed was the buying of Atlantic and Pacific Telegraph stock from 18 to 40. As a part of the plan it was arranged that suits were to be begun against the Western Union contesting the Page patent. Gen. Butler was selected as the agent of the pool in Washington, and to him were assigned, it is said, \$250,000 worth of stock, on which, if the pool had succeeded, he would have made \$50,000. His duty was to urge the Telegraph Bill in Congress. Dorsey of Arkansas, the well-known railroad speculator, was the agent of the Ring in the Senate, introducing the same bill which Butler introduced in the House.

At the same time Mr. Dawes turned up as the assistant of Butler in the job. At the request of Butler he introduced and got passed the resolution for an investigation by Butler's committee into the relations of the Associated and American Press Associations to the Western Union Telegraph Company. The object of all this was to depress Western Union stock, and put up Atlantic and Pacific stock. Jay Gould's organ, the *Tribune*, was used to aid the scheme, and the *Graphic* devoted columns daily to the job.

Butler did all he could here in Washington, and one day the stock touched 80. Large numbers of people in New York and Washington had been quietly let into the scheme, and even the operators of the Franklin and Atlantic and Pacific were induced to put in their little piles. Suddenly the bottom dropped out of the whole speculation, and the stock slowly receded to its original figures. It is said here that Butler is left with his 2,500 shares on his hands and has not made a cent. Since there has been no prospect of any money coming out of it, no more efforts have been made to pass the Telegraph Bill in the House.

## THE UNDERGROUND TELEGRAPH BILL.

A bill was introduced in the State Assembly yesterday by Mr. Daly, which provides that within six months after its passage all telegraph wires in cities of the State containing over 200,000 inhabitants shall be placed beneath the surface of the street or sidewalk and that the local authorities shall cause the telegraph poles to be removed within the same period.

William Orton, President of the Western Union Telegraph Company, yesterday afternoon, when asked for his views in regard to the bill, said that he had no idea that the Legislature would pass such a bill. The right of telegraph companies to erect poles for supporting their wires had been previously granted by the Legislature. It was a vested right which could not be interfered with or taken away. Besides this, there were innumerable difficulties in the way of placing the wires underground. The non-conducting material which would surround the wires was liable to decomposition, and the obstructions arising from sewers and water and gas pipes were great. The streets were frequently opened for one purpose or another, and one careless stroke by a workman might sever all telegraphic communication. The entire removal of the wires from the poles, Mr. Orton regarded as impossible. He said that he contemplated making some experiments on short distances; but to undertake to bury all the wires in the city and make them work successfully, in the present condition of the island, was an impossibility. The companies ran their wires, whenever permission could be obtained, over the roofs of buildings. He could not recall a single accident which had occurred from the breaking of wires or falling of poles during a storm. The principal objection to telegraph poles is that they disfigure the streets; but the art idea has not been predominant in building the city, and telegraph poles were no more unsightly or inconvenient than awnings, show-cases, and merchandise exhibited on the street or sidewalk. In every city there were difficulties in laying wires underground, but in London and Paris they were much less than here. In London the heart of the city was finished, and the opening of streets or laying of pipes was rare. In Paris there were comparatively no obstructions, on account of the perfect sewer system. This was a complete subterranean plan of passages, large enough for a man to pass through, and in these the telegraph wires were suspended as easily as they would be through the Harlem tunnel. If the bill should be carried, the companies would be compelled to look carefully to their obligations, but the bill would probably be equivalent to so much waste paper. How much damage would result from carrying the law into effect could not be predicted. Open warfare between the city authorities and the telegraph companies would undoubtedly produce a serious interruption of business. This bill, Mr. Orton said, had had no backing except from the newspapers, and the public generally have complained less of these appliances than of the apertures of railroads and street cars on city thoroughfares.—*N. Y. Tribune*.

A Frenchman has recently brought out an invention called the Electrical Tinder-box, which is small enough to go into a cigar case. It consists of a very small galvanic battery, put in action by touching a spring, the current heating a platinum wire sufficiently to light a cigar or to set fire to cotton wool steeped in spirits or petroleum.

## THE ELECTRIC LIGHTS AT SOUTH FORELAND LIGHT HOUSES.

The electro current is generated by means of large magneto-electric machines, which are driven by means of belting connected with a steam engine. Each machine is composed of ninety-six helices mounted upon six gun metal wheels, each having sixteen helices. Between these wheels are placed the magnets, eight in each division, forty of which are composed of six layers or leaves riveted together, and sixteen the end ones, having three leaves. The magnets, which are mounted in frames, are stationary, while the helices revolve at the rate of 400 revolutions per minute.

The power absorbed by the machine alone, disregarding friction, is four indicated horse power. The power of a magneto-electric machine is according to the gross attractive power of its magnets, each magnet having a certain lifting or attractive power, expressed in pounds. In the machines at South Foreland each of the six-plate magnets will lift 108 pounds, and each three-plate magnet will lift 54 pounds, making the attractive power of the magnets in one machine to be  $40 \times 108 + 16 \times 54 = 5,184$  pounds. The proportion of the lifting power to the weight of a magnet is a good indication of its value, and, generally speaking, a magnet which will lift two and one half times its own weight is a good one. Each six-plate magnet at South Foreland has a weight of 43½ pounds and will lift 108 pounds.

The machines are connected with the electric lamps placed in the lenses of the tower by underground cables. The carbons used in the lamps are 10 inches long by three-eighths of an inch square, regulated by automatic apparatus, and are consumed at the rate of four inches per night for each lamp. The lenses are about the same size as ordinary third order lenses.

## ELECTRICITY A SUBSTITUTE FOR COAL OIL.

The dangers of kerosene may possibly be done away by the invention of a Russian who claims to have discovered a process for producing light by electricity, which is thus described: A small tube of glass, not more than six inches in length, is filled with a pencil of charcoal; the air is exhausted and the tube hermetically sealed. A moderate current of electricity is then passed through the charcoal from an ordinary electro-magnetic machine, causing it to glow with a very brilliant, but at the same time, a soft light. It is stated that the charcoal is not perceptibly consumed by the process, but will last for an indefinite period, and that the strength of the current required is so small that two hundred of these lights, at considerable distance apart, can be easily maintained by a single machine. The inventor claims that he can light the whole city of St. Petersburg, both street-lamps, stores and private residences, by a single fifteen horse-power machine, with no greater cost than that of running the machine. Moreover all the lamps in the city would be lighted at the same moment, and private lights would need no attention except the shutting off of the current from the house when desired.—*Pharmaceutical Gazette*.

A TELEGRAM received from Copenhagen informs us that the Great Northern Telegraph Company has received a telegram from China, stating that the land line from Foochow to Amoy has been destroyed by persons hostile to the construction of telegraphs. The material was also destroyed or carried away but the members of the telegraph staff remain unmolested.



NOTES OF A COURSE OF SEVEN LECTURES  
ON ELECTRICITY.

BY PROFESSOR TYNDALL, LL.D. F.R.S.

[From The Telegraphic Journal.]

Dr. Tyndall has just commenced a course of lectures on subjects connected with electricity, which are delivered and illustrated in the way characteristic of that unrivaled lecturer. We have much pleasure in giving the notes of the first lecture. The rest will follow in due course. Professor Tyndall's illustrative experimental apparatus was of the simplest character. His electroscope was a light lath about three feet long, balanced on the rounded end of an egg. The effects of repulsion were shown by suspending with long silk thread two india-rubber balloons—children's toys—close to each other, and exciting them with the hand. His sources of electricity were glass jars, native amber, rock crystal, india-rubber, ebonite combs, gutta-percha, &c. The conduction of the human body was shown by the suspension and insulation of his active and able assistant, Mr. Cottrell, whose nose, to the great amusement of the audience, was made the attractive point of a light balanced scale. Many of the experiments were historical, and all were of that simple character which admit of easy repetition at home.

## LECTURE I. February 4, 1875.

1. Many centuries before the Christian era it had been observed that yellow amber (*Elektron*), when rubbed, possessed the power of attracting light bodies.

2. The human mind soon began to show its discontent with the mere fact of observation, desiring something beyond it. What, it was asked, was the cause of this power in rubbed amber? Thales, the founder of the Ionic philosophy (B. C. 580), imagined the amber to be animated by a kind of life.

3. So matters remained for nearly 2,200 years. In 1600 Dr. Gilbert, physician to Queen Elizabeth, whose attention had been successfully devoted to magnetism, passed from it to electricity. He showed that not only amber, but various spars, gems, fossils, stones, glasses and resins exhibited, when rubbed, the same power as amber.

4. Robert Boyle (1675) suspended rubbed amber, and proved that it, which attracted other bodies to itself, was in turn attracted by a body brought near it. He also observed the *light* of electricity, a diamond with which he operated being found to emit light when rubbed in the dark.

5. The tendency to physical theory showed itself in Boyle. He imagined that the electrified body threw out a glutinous or unctuous effluvium, which laid hold of small bodies, and in its return to the source from which it emanated carried them along with it.

6. The human mind was at this time in the condition of a wound-up spring from which the detent had been removed. The desire and capacity for investigation came suddenly into play. Otto von Guericke, contemporary of Boyle and inventor of the air-pump, augmented the electric power previously obtained, and devised the first electrical machine, which was a ball of sulphur about the size of a child's head. His sphere of sulphur, turned by a handle and rubbed by the hand, emitted light in the dark.

7. Von Guericke also noticed that a feather, after having been once attracted towards his sulphur globe, was afterwards repelled and kept at a distance from it, until, having touched another body, it was again attracted. He also observed the hissing of the "electric fire," and that a body brought near his

excited sphere became electrical, and was attracted by another body brought near it.

8. The members of the Academy del Cimento examined various substances electrically, proving smoke to be attracted, but not flame. Flame, they found, deprived an electrified body of its power.

9. They also proved fluids to be sensible to the attraction of amber; showing that an eminence was formed when rubbed amber was brought over the surface of a liquid, the liquid being finally discharged against the amber.

10. Sir Isaac Newton rubbed a flat glass, and caused light bodies to dance between it and a table. He also noticed the influence of the rubber in electric excitation. His gown, for example, was much more effective than a napkin. Newton imagined that the excited electric emitted an elastic fluid which penetrated glass.

11. Electric light *in vacuo* was first observed by Picard in 1675. While carrying a barometer from the Observatory to the Porte St. Michel in Paris, he observed light in the vacuum portion. Sebastien and Cassini observed it afterwards in other barometers.† John Bernoulli devised a "mercurial phosphorous," by shaking mercury in a tube which had been exhausted by an air-pump. This was handed to the King of Prussia—Frederick I.—who awarded for it a medal of forty ducats value. The great mathematician wrote a poem in honor of the occasion.

12. In 1705 Hawksbee made some celebrated experiments on this subject before the Royal Society. He also observed light *in vacuo* produced by the approach of an electrified body to an exhausted glass globe, and remarked on the color of the light.

13. Dr. Wall (1708) operated with large elongated pieces of amber. He found *wool* to be the best rubber. "A prodigious number of little cracklings" was heard on rubbing the amber, and every one of them produced a flash of light. By holding one's finger at a little distance from the amber, a large crackling was produced, with a great flash of light succeeding it. "This light and crackling," says Dr. Wall, "seems in some degree to represent thunder and lightning." (*Phil. Trans.*, 1708, p. 69.) This was the first allusion to thunder and lightning in connection with electricity.

14. Stephen Gray (1729) experimented with a glass tube stopped by a cork. When the tube was rubbed the cork was found to attract light bodies. "Much surprised," Gray "concluded that there was certainly an attractive virtue communicated to the cork." This was the starting point of our knowledge of electric conduction.

15. A fir stick, four inches long, and stuck into the cork, was also found to attract. Gray first lengthened his sticks and then passed on to packthread and wires. Through the thread from the top window of a house he attracted light bodies at the bottom. Suspending a hempen line by loops of packthread, he failed to transmit the electric power. Suspending it by loops of silk he sent the "virtue" through 765 feet of the line. He thought the silk effectual because it was *thin*; but on replacing a loop of it, which had broken, by a still thinner wire, he obtained no action. Finally, he came to the conclusion that his loops were effectual, not because they were thin, but because they were *silk*. This was the starting point of our knowledge of insulation.

16. Gray also found that the mere approach of an excited tube was sufficient to produce attraction at a distance. This action will subsequently be considered under the head of *electric induction*. He experimented on fluids and on animal bodies, using in the first instance soap-bubbles formed of Thames

water, and in the second a boy suspended by hair lines in a horizontal position. He was not aware of the part played by moisture in his rods, lines and tissues.

17. Gray suspended pokers, tongs and fire-shovels by silk strings, and electrified them. To facilitate the process he attached to them tassels of thread, and these simple devices led up to the prime conductor of the electrical machine. Gray also observed the electric brush, snappings and sparks, and makes the prophetic remark that "though these effects are at present only minute, it is probable that in time there may be found out a way to collect a greater quantity of the electric fibre, and consequently to increase the force of that power; which by several of those experiments, if we are permitted to compare great things with small, seems to be of the same nature with that of thunder and lightning." This is much more definite than Dr. Wall.

Stephen Gray was dying when his last experiments were made. Unable to describe them himself, he dictated an account of them to Dr. Mortimer, Secretary of the Royal Society, the day before his death.

18. Du Fay (1733 to 1737) extended the name of "electrics" (the name given to bodies capable of being electrified). He established the influence of moisture, and conducted the electric power through 1256 feet of moist packthread.

19. Stephen Gray obtained *attraction* through the human body. Du Fay first obtained a *spark* from a human body. He tried to fire gunpowder and inflammable substances by this spark, and failed.

20. Du Fay announced the important discovery that there are two kinds of electricity. Gold leaf, floating in air, he found to be first attracted, then repelled by the same body. When repelled by rubbed glass it was attracted by rubbed resin, and when repelled by rubbed resin it was attracted by rubbed glass. Hence the terms *vitreous* electricity and *resinous* electricity. Du Fay proved each of them to be self-repulsive, while attractive of the other. This is the fundamental law of electric action.

21. To ascertain the kind of electricity with which a body is charged, Du Fay adopted the correct test of repulsion. Attraction is not a safe test.

22. Dr. Desaguliers (1741-42) made many sagacious observations and remarks on electricity. He found that he could electrify a wax candle, but that near the flame the electricity disappeared. He ranked pure *air* among his electrics.

23. It is now time to say that the distinction between electrics and non-electrics is really a distinction between insulators and conductors. The conductors being held in the hand and rubbed, the excited electricity immediately escaped, while it was retained upon the surfaces of insulators. When properly insulated the most perfect conductor can be electrified by friction.

ON A NEW ARRANGEMENT OF THE HYDRO-ELECTRIC SULPHATE OF COPPER PILE.—*M. Troué*.—This is a modification of the constant current battery (with sulphate of copper) devised by M. Becquerel, in 1829. The salts of copper and of zinc, which are in contact with metals of the same name, in each couple, are simply maintained by capillary action in plugs (*tampons*) of paper. The pile is of small size, and very portable; it has the same electromotive force as an ordinary sulphate of copper pile of the same number of couples, and may continue to act for a long time if placed in a closed receiver, in order to avoid desiccation of the paper. When the water evaporates, the pile ceases to act; but it resumes its action when moistened again.

WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, March 10, 1875.

### DIVIDEND No. 32.

THE BOARD OF DIRECTORS have declared a Quarterly Dividend of **TWO PER CENT.** on the Capital Stock of this Company, from the net earnings of the three months ending March 31st instant, payable at the office of the Treasurer, on and after the 15th day of April next, to shareholders of record on the 20th day of March.

The transfer books will be closed at three o'clock on the afternoon of the 20th instant, and opened on the morning of the 16th of April.

R. H. ROCHESTER,  
Treasurer.

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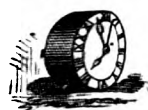
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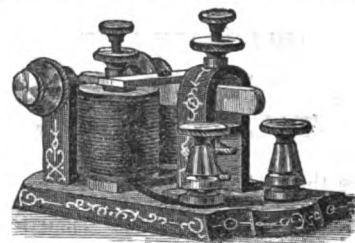
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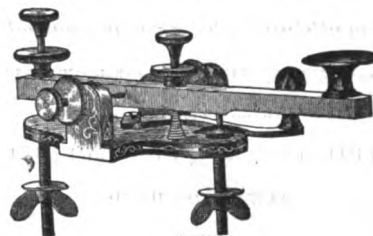
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Batteries and Supplies of all kinds at the lowest prices. Send for Price List and Catalogue. Special Prices on large orders sent by mail. Address,

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No. 9 Slater Avenue, Cleveland, Ohio.



**BUY THE BEST.**

IF YOU WANT

**EQUIPMENT**

FOR A

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**L. G. TILLOTSON & CO.**

They have the **GREATEST VARIETY.**

They carry the **LARGEST STOCK.**

Their **PRICES** are the **LOWEST**

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THEY GUARANTEE

*Everything to be as represented.*

They always **RECTIFY MISTAKES** at their **OWN EXPENSE**

EVERY ARTICLE REQUIRED FOR THE

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THEIR

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**TELEGRAPH INSTRUMENT FOR STUDENTS**

Comprising Sounder and Key, is the **greatest**

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## THE WESTERN ELECTRIC MANUFACTURING CO.

220 EAST KINZIE STREET CHICAGO, ILL.

KEEP IN STOCK THE FOLLOWING ARTICLES:

GALVANIZED WIRE,  
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SCREW GLASS INSULATORS,  
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BRACKETS, PINS, SPIKES,  
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PLIERS, VISES, PULLEYS, CLIMBERS,

WINDOW TUBES, BATTERY BRUSHES,

SYRINGES, FUNNELS, HYDROMETERS,

ACIDS AND CHEMICALS FOR BATTERIES,

KERITE WIRE,

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GUTTA PERCHA OFFICE WIRE,

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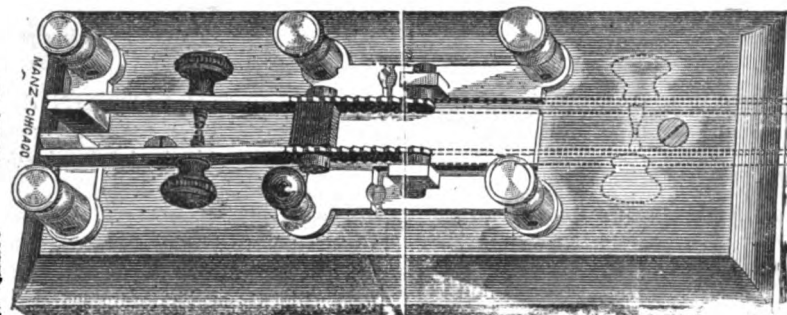
DANIELL BATTERY,

GROVE BATTERY,

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REGISTERS,  
RELAYS,  
BOX RELAYS,  
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PLUG CUT-OUTS,  
CUT-OUTS, (new style),

REPEATERS,  
SWITCHES,  
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ALARM BELLS.

Our Morse Instruments are of the Western Union, Ottawa (or Caton) style.

We have ample facilities for the execution of every variety of electrical work.

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L. G. TILLOTSON & CO.

Beg to announce the Opening of an Establishment for the sale of

**TELEGRAPHIC & ELECTRICAL GOODS**

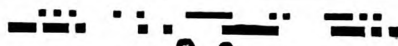
OF EVERY DESCRIPTION, AT

No. 54 South Fourth Street,

COR. OF CHESTNUT,

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They solicit the patronage of their friends and the  
Telegraphic Fraternity generally.



SENT ON RECEIPT OF PRICE.

26 & 27 Waring Block, Cleveland, O.

**NO OTHER MAIN LINE SOUNDER**  
has proven as **PERFECT** AN INSTRUMENT as that  
made by us the past two years.

**LOW RESISTANCE, EASY ADJUSTMENT AND  
HANDSOME APPEARANCE COMBINED.**

No other instrument offered for this purpose has the advantages secured to ours. See other columns of this paper.

WATTS & COMPANY,

No. 47 Holliday Street,

BALTIMORE, MD.

Send for Catalogue and Price List.

## The "Snapper" Sounder.



TRADE MARK. PATENTED MAY 12th, 874.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 40c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

**PRICE 75 CENTS.**



Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

## Patent Security Message Hook.

The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

Price 30 cents each.

Price per dozen \$3.00.

**LIBERAL TERMS TO THE TRADE.**

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## SCREW GLASS INSULATORS AND BRACKETS

Of the size and thread used by the Western Union Telegraph Company

Having secured an Exclusive Agency for these Insulators, (manufactured under the Cauvet patent,) we are filling orders promptly for large or small quantities, at prices as low as any insulator can be sold for in the market.

**THE WESTERN ELECTRIC MANUF'G CO.,**

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**WATTS & COMPANY,**  
No. 47 HOLLIDAY STREET,  
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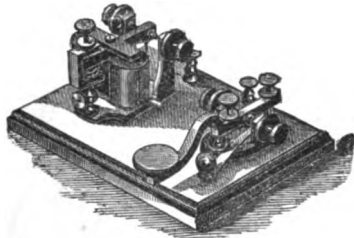
**SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS,  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
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Special attention given to repairing Scientific instruments.  
Several of our workmen having served their time in the most  
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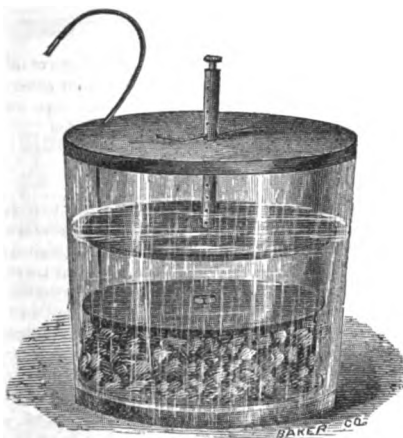
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[ESTABLISHED 1855.]



\$11.50.

**MANUFACTURER OF  
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## BLISS' RESERVOIR BATTERY.



Price per Cell, \$2.

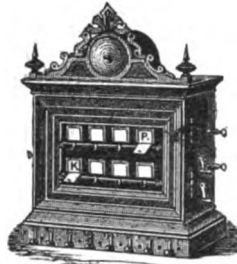
It will run as a local battery for six months without atten-  
tion, and as a main battery for a longer period.

**GEO. H. BLISS & CO.,**  
41 Third Avenue,  
CHICAGO, ILL.

## CHAMPION

**Burglar & Alarm Annunciator Company,**

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We invite Telegraph Managers and Operators throughout the  
country to act as our Agents for the introduction of our Superior  
Burglar Alarms and Annunciators into Private Houses, Hotels,  
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Upon receipt of plans of houses, we will send skilful mechan-  
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*Our Alarms and Annunciators have just been awarded the  
First Premium of the American Institute.*  
Explanatory Circulars will be furnished upon application to  
the Secretary.

**L. G. TILLOTSON,**

*President.*

**CORNELIUS ROOSEVELT,**

*Sec'y and Treas.,*

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## Gold and Stock Telegraph Company.

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This Company furnish

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To its Subscribers, by

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At their respective places of business; and also erect and maintain

**PRIVATE TELEGRAPH LINES**

For Corporations and Individuals, operated with

**PRINTING INSTRUMENTS.**

As manufacturers of all the perfect TELEGRAPHIC PRINTING  
INSTRUMENTS in use, and owners of a large number of Patents,  
we are prepared, under the facilities of our contracts with the WES-  
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## AMERICAN FIRE ALARM

AND

**POLICE TELEGRAPH.**

**GAMEWELL & CO., PROPRIETORS,**

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**ELECTRICAL CONSTRUCTION & MAINTENANCE CO**  
San Francisco, Cal. *Special Agents for California, Oregon  
and Nevada.*

This system of Fire Alarm and Police Telegraph, with a Central  
office, or upon the

### AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is  
made for evidence of its great SUPERIORITY, VALUE and UNI-  
FORM reliability:

Albany, N. Y.,	New Orleans, La.,
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Boston, Mass.,	Newark, N. J.,
Buffalo, N. Y.,	Omaha, Neb.,
Baltimore, Md.,	Philadelphia, Pa.,
Chicago, Ill.,	Pittsburg, Pa.,
Cincinnati, Ohio,	Portland, Me.,
Columbus, Ohio,	Peoria, Ill.,
Cambridge, Mass.,	Providence, R. I.,
Charlestown, Mass.,	Quebec, L. I.,
Covington, Ky.,	Rochester, N. Y.,
Detroit, Mich.,	Richmond, Va.,
Dayton, Ohio,	Indianapolis, Ind.,
Elizabeth, N. J.,	St. Louis, Mo.,
Fall River, Mass.,	St. John, N. B.,
Fitchburg, Mass.,	Springfield, Mass.,
Hartford, Conn.,	San Francisco, Cal.,
Jersey City, N. J.,	Savannah, Ga.,
Louisville, Ky.,	Syracuse, N. Y.,
Lawrence, Mass.,	Troy, N. Y.,
Mobile, Ala.,	Toledo, Ohio,
Montreal, Canada,	Toronto, Canada,
Milwaukee, Wis.,	Washington, D. C.,
New York City,	Worcester, Mass.,
Lynn, Mass.,	New Bedford, Mass.,
Lowell, Mass.,	Bridgeport, Conn.

The distinctive features of these systems of  
**FIRE ALARM AND POLICE TELEGRAPHS,**

ARE,

*First*—The AUTOMATIC SIGNAL BOXES, the simple electro-  
mechanism of which enables any one—even a child—to give an  
instantaneous, general, and definite alarm of fire.

*Second*—The AUTOMATIC REPEATER, through which the appa-  
ratus may be distributed in a combination of circuits, and the  
entire system successfully worked without the constant personal  
attention of either operators or watchmen.

*Third*—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to  
produce the full tone of the largest church or tower bells.

*Fourth*—The ELECTRO-MECHANICAL GONG STRIKER, for hose  
and engine houses, by means of which the location of the fire is  
instantaneously communicated to the members of each fire co-  
pany.

*These features combined form the*

**ONLY PERFECT, COMPLETE, AND RELIABLE SYSTEM**

OF

**FIRE ALARM TELEGRAPH IN THE WORLD.**

Messrs. GAMEWELL & CO. are the owners of the original  
**FARMEY AND CHANNING PATENTS**, one of the most im-  
portant of which has just been extended for seven years.  
During the past seventeen years they have spared no expense or  
effort to secure improvements, and the systems are now cov-  
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**MORE THAN TWENTY PATENTS.**

The introduction and operation of the  
**AUTOMATIC SYSTEM**

involves so little expense, compared to the benefit which it con-  
fers, that even small communities can profitably adopt and  
maintain it.

*The co-operation of TELEGRAPHERS in securing its introduction  
into their localities is cordially invited, and  
their efforts will be duly appreciated  
and compensated.*

Any information desired in regard to the above system will  
be cheerfully and promptly furnished on application at the  
office.

A pamphlet setting forth more fully its advantages and su-  
periority, has been printed, and will be supplied to Municipal  
Authorities and others interested in Fire Alarm and Police  
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## A SUPERIOR PRINTING TELEGRAPH INSTRUMENT, FOR PRIVATE AND SHORT LINES,

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. E. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is SIMPLE, RELIABLE, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

### PRIVATE LINES

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employes, &c., for the introduction of the Printer. For further particulars, terms, &c., apply to

### MERCHANTS' MANUFACTURING AND CONSTRUCTION CO.,

S. J. BURRELL, Superintendent,  
No. 50 BROAD STREET, Rooms 12, 13, 14,  
P. O. Box 496.

## JOSEPH MOORE & SONS,

Established 1820,

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Below Green St.,

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## Insulated Wire Manufacturers.

INSTRUMENT AND OFFICE WIRES

FLEXIBLE CORDS CABLES,

HEAVY INSULATED LINE WIRE

RESISTANCE WIRE.

Wires of every variety of Insulation

### WILLIAM E. DAVIS,

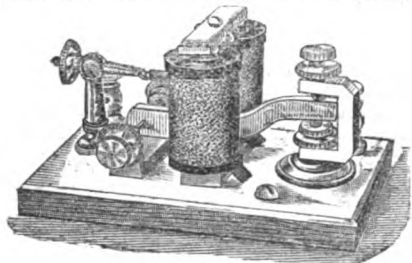
Manufacturer and Dealer in

## TELEGRAPH INSTRUMENTS,

341 Newark Avenue, Jersey City, N. J.

Now offer for sale, or will manufacture to order all kinds of Telegraph Material.

### NEW STYLE SOUNDER—"UNCLE SAM."



Price \$6.00.

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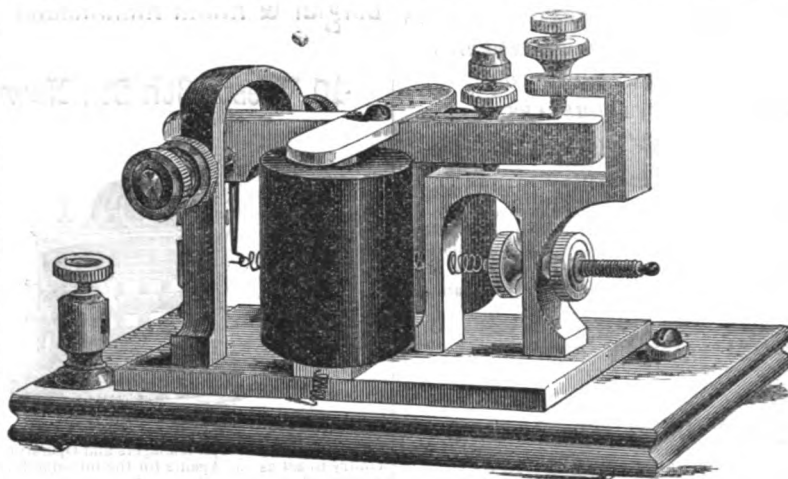
**OFFICE AND MAGNET WIRE,**  
BRAIDED AND WOUND,  
SINGLE and DOUBLE, with COTTON,  
LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.  
Manufactured and for Sale by

**WESTERN ELECTRIC MANUFACTURING CO.,**  
CHICAGO.

## PARTRICK & CARTER'S Giant Sounder Perfected.

**OFFICE & MAGNET WIRE,**  
BRAIDED AND WOUND, SINGLE and DOUBLE,  
with COTTON, LINEN, SILK;  
Paraffined or Varnished, Compressed and Polished.



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every Instrument Warranted Perfect.

**PRICE \$7.50.**

Sent C. O. D. by Express. On Receipt of Money Order, \$7.00.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.; or \$8.00 if Money Order for the amount sent in advance.

The latter plan will additionally save the purchaser the Express charges for returning money.

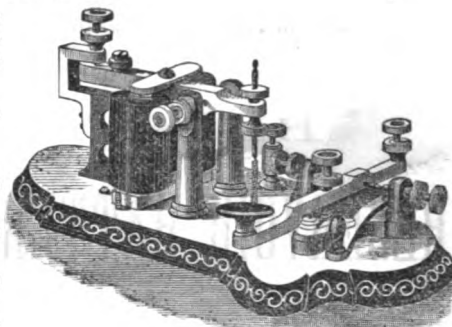
Price of single instrument, good for one mile or less, without Battery, &c..... \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c..... 7 50

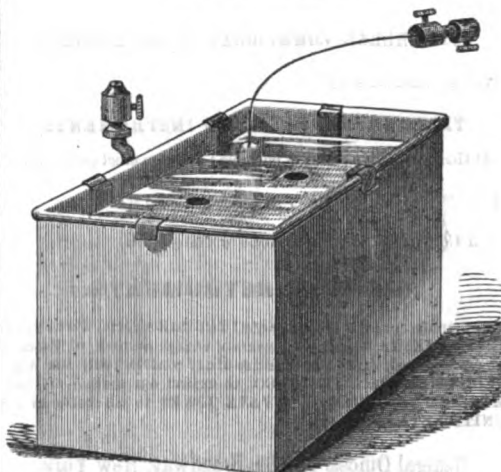
Price of single instrument, good for one to twelve miles, without Battery, &c..... 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c..... 8 50

THIS IS WARRANTED TO BE, BEYOND ALL COMPARISON THE BEST APPARATUS ever offered for the use of STUDENTS OF TELEGRAPHY. Being excellent Morse Instruments, substantially made and nicely finished, with nothing left out of their construction which pertains to a complete sounder and key combination set; NOTHING MADE IN MINIATURE OR IN AWKWARD AND UNUSUAL SHAPE, as is done with the very cheap affairs usually offered as learners' apparatus. They are equally well suited for



## EAGLES' METALLIC BATTERY.



THE EAGLES METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Damells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

FOR OPEN CIRCUITS, where all other gravity batteries are acknowledged FAILURES, the Eagles Battery is found to be, in every respect, A PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - \$2.25  
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**PARTRICK & CARTER, Sole Agents,**

38 South 4th St., Philadelphia, and 22 Dey St., New York.



PATENTED JUNE 24, 1873.

## SPECIAL NOTICE.

THAT

"THE BEST IS ALWAYS CHEAPEST"

as demonstrated by the unprecedented demand which has arisen for our

## Excelsior Telegraph Apparatus

For STUDENTS and AMATEURS.

The custom introduced by us of making Agents of Managers and Operators, and sharing the profits from the sales of these instruments with them, has also assisted in increasing our sales to such an extent that we have been compelled to enlarge our facilities for their manufacture.

We are now prepared to furnish these unrivalled Amateur Instruments, with or without Office Outfits, in any quantity, and at a moment's notice. Our Agents may now send in their orders as rapidly as they please, and can rely upon their being promptly executed.

### PRICES AS HERETOFORE.

Instrument Complete, Key and Sounder .....	\$6 50.
Instrument, with Office Outfit .....	7 50.
Two Instruments and Outfits .....	14 50.

L. G. TILLOTSON & CO.,

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104 CENTRE STREET, N. Y.,  
TELEGRAPH ENGINEER,

And Manufacturer of

INSTRUMENTS, BATTERIES,  
AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES.

Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their business, domestic and foreign, enabling them to keep pace with telegraphic progress.

They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

## F. L. POPE & CO.,

Manufacturers and Dealers in

## Telegraph Instruments and Supplies,

38 Vesey Street, New York.

## STANDARD TELEGRAPH INSTRUMENTS, RELAYS SOUNDERS, REGISTERS AND KEYS,

BATTERIES,  
INSULATED WIRES,

CHEMICALS of all kinds, etc.  
THE NONPAREIL TELEGRAPH INSTRUMENT for amateurs, learners and short lines.

Over 2,000 of them have been sold, and the demand for them continues unabated.

Globe Lightning Arresters,  
Bradley's Apparatus for Electrical Measurement,  
Bradley's Box Relays and Sounders  
and Naked Wire Helices and Magnet Spools  
Iso, Agents for Hochhausen's Superior Low-Priced  
Telegraph Instruments.

Sole Agents for the

Eagles Metallic Galvanic Battery.

The demand for this Battery is rapidly increasing, and it is conceded by all who have used it to be the *Best and most Economical* Battery, for telegraphic and other purposes, offered to the public.

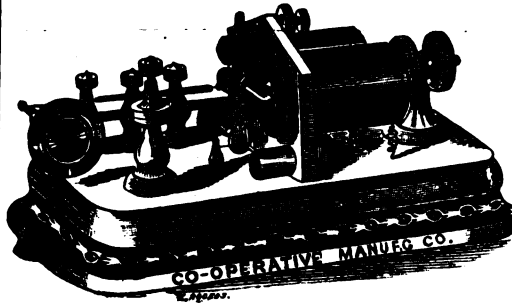
Descriptive Circulars and Price List forwarded upon application to

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P. O. Box 5503

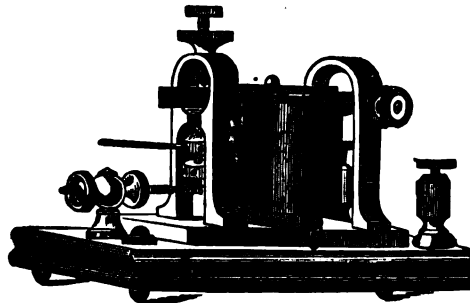
## Co-operative Manuf'g Co., 216½ Walnut St., Phila.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. Is finely finished.

Price, - - - \$16.



Railroad Sounder.

This Sounder is noted for its loud, clear and firm tone, entirely free from that sharp ring peculiar to most instruments, and which eventually becomes so painful to the ear of the operator.

N.B.—We have improved our Sounders by using capstern head screw and nut, as represented in cut.

Price, \$7.

By the Dozen, \$6 50.

Sent by Express, C. O. D., or upon receipt of money order.

SEND FOR PRICE LIST.

W. R. BALDWIN, Manager, 216½ Walnut St., Phila.

## CALLAUD BATTERY, KEPT ON HAND,

AND  
Orders filled by

W. MITCHELL McALLISTER,

728 Chestnut Street, Philadelphia,

CHARLES WILLIAMS Jr.

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AND BY

THE WESTERN ELECTRIC MANUF'G CO.,

Agents for the United States,

220 East Kinzie St., Chicago, Ill.

## LECLANCHE BATTERIES.

### IMPORTANT NOTICE.

After January 1st, 1875, we will allow 20 Cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

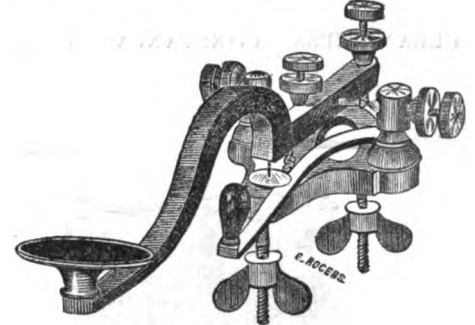
A list will be furnished on application to

THE LECLANCHE BATTERY CO.,  
40 West 18th St.

Or to L. G. TILLOTSON & CO.,

Sole Agents,  
8 Dey St.

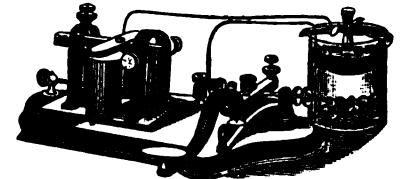
PHILADELPHIA: 54 South Fourth Street  
CINCINNATI: 22 West Fourth Street.



No. 1 Key.

This Key is of a beautiful design, and durable in construction, and is perfect in all things which constitute an excellent working Morse Key. No. 1 Key Curved or Straight Lever.

Price, - - - \$4 75



Co-operator's Learner's Instrument.

A complete outfit, embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practicing or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined. The instructions are clear and practical, and contain all information necessary for the student. All technical terms and expressions are avoided, as they only perplex and make the road to knowledge more difficult.

Learners' Instrument complete, \$9.50

without Battery, \$5.00.

No. 2 Learner's \$5, with Battery, \$6 50.

Sent by money order.

## THE AMATEUR'S Telegraph Apparatus.

With this Instrument is furnished

A Complete Outfit for the Student,

INCLUDING

BATTERY,  
CHEMICALS, and  
MANUAL.

There are several thousand in use.

### PRICES:

Complete Outfit .....	\$7 50
Sounder and Key .....	6 50
" " with Out-Out and Lightning Arrestor .....	8 00
No. 2 Complete .....	5 50
" Instrument only .....	4 50

GEO. H. BLISS & CO.,

41 THIRD AVENUE,

CHICAGO, ILL.

## ORTON'S PATENT PENCIL HOLDER.

This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS.

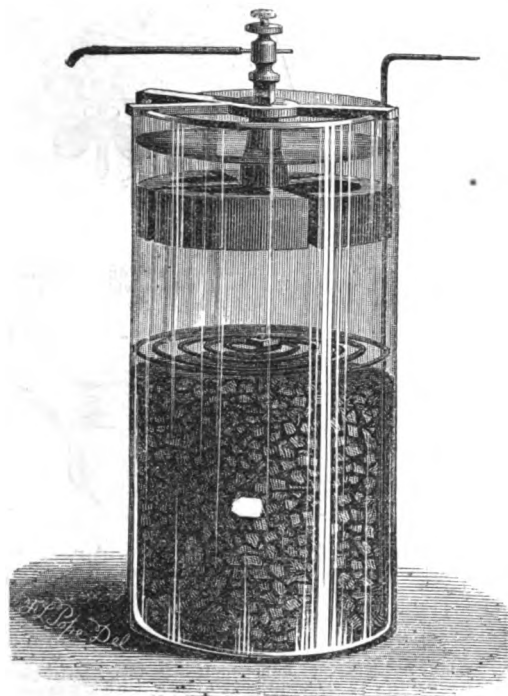
When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price

Price per dozen, - - 60 cts.

## THE PERFECT BATTERY.

CLEANLINESS. CONSTANCY. ECONOMY.



THE

## LOCKWOOD BATTERY,

PATENTED APRIL 8, 1873,

L. G. TILLOTSON & CO., Sole Agents,

No. 8 DEY STREET, N. Y.

This Battery has been in extended practical use for more than a year, and is now acknowledged by leading Electricians in this country and Europe to be

**FAR SUPERIOR TO ALL OTHERS**

for telegraphic purposes, or closed circuits of any description. This Battery received the **FIRST PREMIUM** over all competitors for

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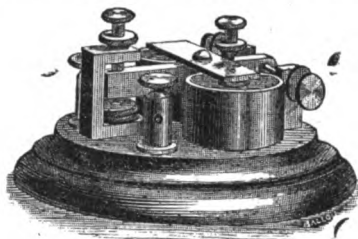
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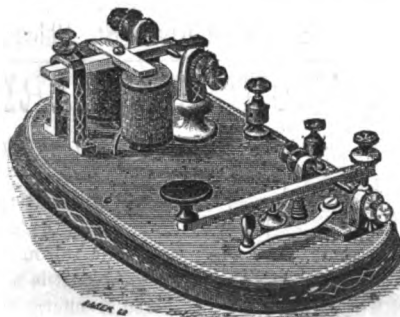
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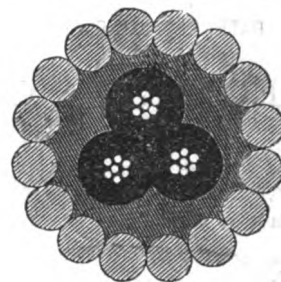
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 7.

NEW YORK, APRIL 1, 1875.

WHOLE NO. 178.

## THE HUGHES PRINTING TELEGRAPH.

[Translated from Schellen's Electromagnetische Telegraph.]

(Continued from page 81.)

### THE APPARATUS AS A REPEATER.

Although by the Hughes system it is possible to operate direct over circuits of considerable length, the range can be greatly increased by the use of automatic repeaters. In one way this can be accomplished by the use of two polarized relays, but this has the disadvantage of leaving no record of the work done by the relay at the office in which it is placed.

Another way, which allows the message to be recorded at the repeating station at the same time it is repeated to a point beyond, consists in allowing the apparatus used as a repeater to send an auxiliary current after the arriving current, by which the latter becomes strengthened and better enabled to perform its work at the distant apparatus. This contrivance is similar to that of the repeating relay, and is arranged in the following manner:

At the armature *n* (Figure 23) an insulated spring *A* is fixed, which is connected to the line. This spring oscillates between the contact screws 1 and 2, separated from each other by the armature *n*. 2 is

applying the repeater in the usual form, the arrangement of the poles would be different.

It will readily be seen that by the arrangement a real translation by means of two apparatus can easily be effected. Two clamps only are necessary to be fixed on the instrument table with which to connect the ends of the coil to the resting contact points of

while, if placed on *c*, the apparatus would be in its usual character. When the wire is in good condition the terminal stations can work together without auxiliary aid, but when in consequence of leakage or other trouble the main current becomes feeble, the intermediate station can act as a repeater in delivering the auxiliary current.

Figure 26 (see next page) shows the connections in an intermediate station which is provided with two apparatuses. This arrangement allows the intermediate station to hold communication with both terminal stations at the same time, as well as to throw a strengthening current upon the line.

The Hughes apparatus is certainly one of the most perfect pieces of mechanism ever created in connection with the electric power, and it is just here that the principal reason is to be found why its universal application, until now, has met with any difficulty. The complication of its parts, and the large power which is required to bring these parts in play with the requisite rapidity, the accuracy with which all parts have to co-operate in order to answer their purpose, and the great rapidity

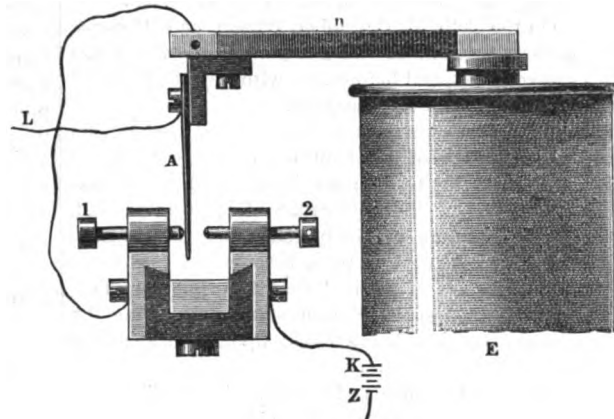


Figure 22.

the springs *A* of each apparatus, as in repeating, the new current should not pass through the receiving magnet, therefore the contact point should not be connected to the coil of its own apparatus.

For an easy comparison with what follows we have in Figure 24 again illustrated the connections of the apparatus at a terminal station (Figure 20) though somewhat differently arranged. In this and also in Figure 25 similar parts of the apparatus are represented by similar characters. Figure 28 represents the connections at an intermediate station, with the repeating arrangement for sending an auxiliary

which the operator, using both hands, must display in order to encompass the capacity of the machine (50 to 60 messages per hour), all this serves to cause

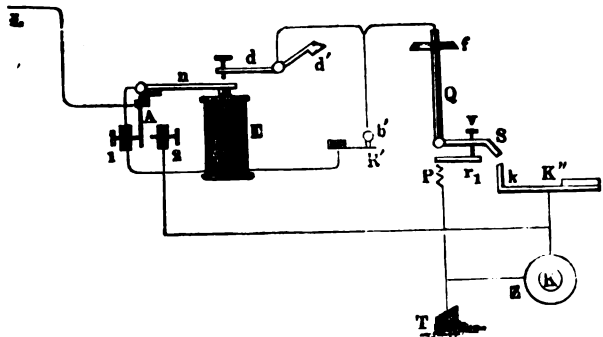


Figure 23.

connected with battery pole *K*. When the armature is drawn to the poles of the magnet the spring *A* rests against screw 1, and when the armature is released the spring comes in contact with screw 2. So that while the armature is in a position of rest the arriving current passes through the spring *A* to the screw 1, and thence through the electromagnet *E* (Figure 23) and the sledge axis *Q* into the line. When the armature is released and the spring *A* comes in contact with screw 2, another, and more powerful current, as shown in the following drawings, passes from the battery at the repeating station through screw 2 and the spring *A* to the line and distant station.

current.

Figure 25 illustrates the complete circuit arrangement of an intermediate station adapted to the sys-

the operators to regard the apparatus in an unfavorable light, the more, when they have been used to handle a more simple apparatus, such as the Morse undoubtedly is. However, the system is successfully breaking its path, and wherever it is in use affords the highest satisfaction.

**EARTHQUAKES AND MAGNETIC DISTURBANCES.**—Mr. Lamont, Director of the Observatory at Munich, says that many cases are known where magnetic disturbances coincide with earthquakes, and states that, on April 18, he by chance saw the needle of the declination instrument receive a sudden jerk, the oscillations continuing for some time. After some days he received news that violent oscillations of the needle had been observed in Parma, and subsequent computations showed that the movement had begun at the same moment in Parma and in Munich.

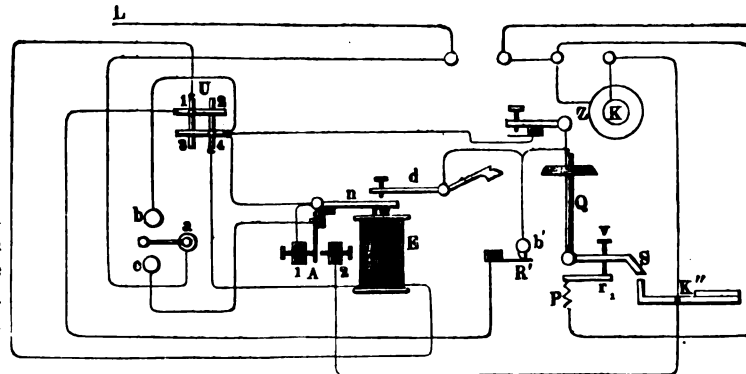


Figure 25.

tem of current strengthening, which is in operation when the crank *a* of the inserter is placed on *b*,



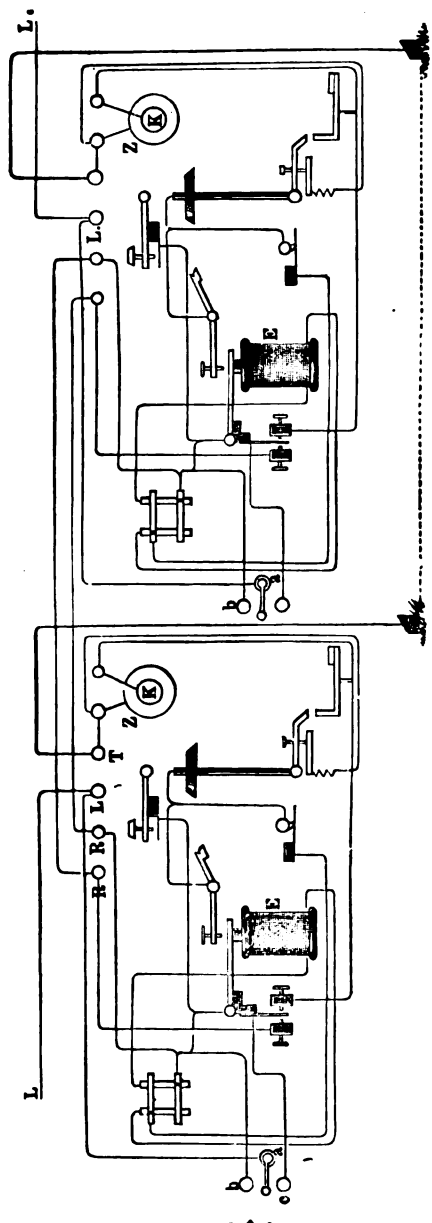


Figure 26.  
(See preceding page.)

BEFORE THE COMMISSIONER OF  
PATENTS.  
IN THE MATTER  
of

The Applications of Thomas A. Edison and George B. Prescott, of August 19th, 1874, for Letters Patent to Thomas A. Edison and George B. Prescott; opposed by George Harrington, by petition dated Jan. 23d, 1875.

The records of the Patent Office material to be considered, are :

1st Agreement.—George Harrington and Thomas A. Edison, dated April 4th, 1871, recorded May 6th, 1871, Liber U 13, p. 412, Transfers of Patents.

2d Assignment.—Thomas A. Edison to George B. Prescott, dated August 19th, 1874, recorded August 29th, 1874, Liber R 18, p. 62, Transfers of Patents.

3d. Various specifications in the applications of Edison, Nos. 94, 95, 96, 97, 98, 99, 100 and 112.

4th. Power of attorney.—Thomas A. Edison to Jay Gould, dated January 6th, 1875, recorded 1875.

5th. Petition of George Harrington, January 23d, 1875, and letter of Thomas A. Edison of the same date.

A portion of these records are printed as an appendix to these points.

On the 19th of August, 1874, Edison assigned (by special reference to the numbers of the applications), one undivided half interest in the whole of each of the inventions described in the specifications attached to the above-named applications, with special stipulations that the Letters Patent, when granted, should belong to them jointly; and requesting and authorizing the Commissioner of Patents to issue the patents to Edison and Prescott, jointly, as assignees of Edison.

In consideration of this assignment, Prescott paid and expended a large sum of money.

At and subsequent to this date, Preston and Edison were in treaty with the Western Union Telegraph Company for the sale of these inventions, and on the 10th of December Edison received \$5,000, on account of the purchase from that company, although the price had not been definitely fixed.

On the 30th of December, Edison and Prescott proposed a sum as full compensation, which was subsequently, and before any withdrawal of the offer, accepted by the company.

After this acceptance it was learned that Edison had, in breach of his contract, given the power of attorney to Jay Gould; still later Mr. Prescott was made aware of the application of Harrington, and, for the first time, of the pretence that the Harrington agreement covered these inventions.

Mr. Prescott is advised that the original application and request by Edison stand, and cannot be revoked by him, being based upon consideration paid.

The attention of his Honor, the Commissioner of Patents, is asked to the following general propositions, which are discussed more at length in the following points :

1. The legal title to one-half interest in the inventions in question is in Mr. Prescott, and therefore all presumptions are in his favor, and the entire burthen is upon any one who seeks to impeach that title.

2. Mr. Harrington must show, beyond doubt, that the paper on which he relies has taken legal effect upon those inventions. If any doubt remains the legal title must stand, with all the incidents attending it, or arising out of the contract with Edison, to wit, that the patent shall be held by them (E. & P.) jointly, and not be dealt with by either, except as permitted by the terms on which Prescott accepted the assignment, and parted with consideration.

3. The agreement of Harrington and Edison is not by its terms an assignment of any such inventions as these; that even were it broad enough by its terms, still it cannot affect these specific inventions as an assignment, because, at the date of its delivery, these inventions did not exist, and could not, therefore, be assigned.

4. The inventions in question, being improvements upon a method of transmitting telegraphic messages known as the "Duplex," do not come within the terms of that agreement, which relates solely to an entirely different subject, viz.: "automatic or fast telegraphy."

5. That this office being without the powers and functions requisite to decide questions of conflicting equities, the proper, prudent and just course for the Commissioner is to issue patents to those possessing the legal title, to wit, Edison and Prescott, leaving such persons as may think they have equities to seek their remedies in a court of competent jurisdiction.

#### POINTS.

I.—Whatever else may be doubtful, two things are certain, viz., (1.) That when Edison delivered the as-

signment to Prescott, he intended to transfer, and supposed that he did transfer, one-half the entire interest in the specific inventions described in affidavits Nos. 94, 95, 96, 97, 98, 99, 100 and 112, now in question, and, (2) That he did not, at that time, understand that he had previously transferred any interest in those inventions.

The assignment to Prescott is not of one-half Edison's interest, but of "one undivided half part of 'the right, title and interest, of every character, in, to and under, and connected with the aforementioned inventions and Letters Patent on the same when granted,' and it 'authorizes and requests the Commissioner of Patents to issue the said Letters Patent to Thomas A. Edison and George B. Prescott,' as assignees, &c.

Thus it is made clear that, notwithstanding the agreement with Harrington, Edison understood himself to be the owner of, and free to convey the one-half of the whole interest, and to make and perform a contract to hold the other half himself. The alternative is that he then intended to practice false pretences, and commit a fraud. We do not charge this, and we presume he will not assert it. *Ex vi termini* his conveyance implies an assurance that he had not previously conveyed two-thirds to Harrington.

These clear implications from his acts, supported by his positive averment, cannot be displaced by a subsequent declaration of an undefined "erroneous impression," made under circumstances of most suspicious nature, which deprive his later statements of all credit.

II.—The language of the agreement with Mr. Harrington, although in the form of an assignment, did not operate as an assignment, so far as these future inventions are concerned, for want of subject-matter. It may have created a personal obligation on Edison, but it did not pass legal title to Harrington, for nothing existed to which even the possible inventor could at that time have a legal title either to keep or transfer.

The law on this point is admirably stated in the following extract from Curtis on Patents :

"Probably it has occurred within the professional experience of many of my readers to be called upon to consider the operation of contracts sometimes made by inventors, by which they have obligated themselves to convey inventions not in esse, and the question may arise whether the recording of such contracts in the Patent Office, within three months from the time of their execution will operate as notice of title, so as to prevent the acquisition of a title by another purchaser after a patent has been obtained. We have seen that a contract of sale of a future invention, although in terms an absolute sale, can operate only as a contract to convey; and there is no statute which contemplates or requires the recording of any conveyance excepting assignments of existing patents, after patents have been obtained or assignment of inventions made and perfected, when it is intended to have the patent issue to the assignee. It has always been assumed that the object for which the Act of 1836, § 11, requiring the recording of assignments of existing patents, within three months, is the protection of subsequent bona fide purchasers; although this object is not specially declared. Assuming, then, that the recording of such an assignment operates as notice to everybody, of the title of the assignee, can such an effect be attributed to the recording of a contract to convey an invention that is not only not patented, but has not yet been made? With respect to patents already issued, an assignment necessarily points to the patent conveyed, and the public records afford to every one the means of ascertaining what has passed by the assignment. But a contract to convey an invention not in esse, although recorded, affords a subsequent purchaser of an interest in a patent no means of ascertaining what the inventor had bound himself to convey to another person. It is true there might be cases where it could be made certain by inquiry whether the invention contemplated by the contract was the same as that subsequently patented. But is the subsequent purchaser bound to institute such an inquiry? We are considering a question of notice of title, and if the instrument supposed to operate as a notice could not, in the nature of things, give the information, can the subsequent purchaser be bound to look elsewhere? This difficulty as well as the further con-

sideration that the statute does not contemplate the recording of such contracts, should, perhaps, lead parties to understand that contracts for the conveyance of future inventions are really of no greater force than as the personal covenants of the inventor to be specifically enforced against him; and that to record them will not necessarily operate as notice of title, so as to defeat a title made by the inventor to another person after he has perfected the invention, and applied for or obtained a patent." Curtis, Law of Patents, p. 206, 4th Ed. § 183, N. 2.

III.—When the assignment to Prescott was made, nearly four years after the date of that to Harrington, inventions *had been made and completed*, and were in form to be definitely described and identified. The inchoate right to a monopoly, which the inventor then for the first time acquired, was property capable of being the subject of bargain and sale, and the words used in the assignment to Prescott were apt words to effect, and did effect *quoad hoc* a transfer of that inchoate right.

"The discoverer of a new and useful invention is vested by law with an inchoate right to its exclusive use, which he may perfect and make absolute by proceeding in the manner which the law requires, and Fitzgerald possessed this inchoate right at the time of the assignment. The discovery had been made, and the specification prepared to obtain a patent. And it appears by the language of the assignment that it was intended to operate upon the perfect legal title which Fitzgerald then had a lawful right to obtain, as well as upon the imperfect and inchoate interest which he actually possessed. The assignment requests that the patent may issue to the assignee \* \* \* and when the party has acquired an inchoate right to it, and the power to make that right perfect and absolute at his pleasure, the assignment of his whole interest, whether executed before or after the patent issued, is equally within the provisions of the Act of Congress." (Gaylor v. Wilder, 10 How., 477, 482-4.)

From this authority, if authority was needed, it is clear that two things only are contemplated by the patent laws as subject to bargain and sale:—1st. The *inchoate right to obtain a patent* (which right does not exist until an invention or discovery has been made sufficiently complete to be described), and 2d, the Letters Patent themselves. It also appears that a valid assignment of the inchoate right transfers the right in the patent when obtained.

What right touching these inventions did Edison possess at the date of the assignment to Harrington? *The right to make these inventions*, if he could, and no more. That being the only right he possessed, he could transfer no other to Harrington. He did not, therefore, transfer then any right touching them; and, being still possessed of all the rights he ever had to them, on August 19, 1874, he transferred an interest to Prescott, who took immediately a *legal title* to be a half owner in the Letters Patent, when issued.

As was said by the Supreme Court, in Gaylor v. Wilder, "it appears by the language of the assignment that it was intended to operate upon the perfect legal title which Fitzgerald (Edison) then had a lawful right to obtain, as well as upon the imperfect and inchoate interest which he actually possessed."

IV.—It being equally indisputable that the legal right is in Prescott, and that the Patent Office is not equipped to exercise equitable jurisdiction, or to measure conflicting equities, it is submitted confidently that the Commissioner must be guided by that fundamental principle of our jurisprudence, which gives possession under the legal title, leaving equitable claimants to contest their rights as plaintiffs. If Harrington has any interest, of which the law can take notice, his proper forum is in the courts. There are numerous reasons why prudence and impartiality require that the patent should be issued to Edison and Prescott, in whose joint custody (in view of their contract on record, forbidding either to license or sell without the consent of the other, and of the known conflict of interest between them which prevents any chance of collusion), they

would be safely held to answer the claims of Harrington or whoever else may be interested. On the contrary, being issued to Edison and Harrington, or to Edison alone, very embarrassing questions might arise in respect to licenses, assignments or grants clandestinely made by them, or by Mr. Edison's attorney, Mr. Jay Gould. These considerations will be discussed more fully under another point.

V.—So far we have, for argument's sake, treated the assignment to Harrington as if it might be construed so as to have reference to the inventions in question. Such is not the fair construction of that instrument. The language made use of is wholly inapplicable to these inventions, except by violent perversion. Moreover, the instrument does not purport to assign future improvements upon anything except what is there named as "Automatic Telegraphy Mechanical Printers."

That assignment recites (as matter of fact) that Edison did (at some former time) agree "to invent and construct \* \* \* full and complete sets of instruments and machinery, that should \* \* \* develop into practical use the *Little, or other system of automatic or fast system of telegraphy*, and subsequently to improve and perfect such instruments and machinery by adding thereto, from time to time, such further inventions as experience should demand, and my ability as an inventor and electrician might suggest; \* \* \* the said invention and improvements to be the joint property of said Harrington and myself" \* \* \*.

Having thus recited a former promise to make certain inventions (if possible), the instrument proceeds to deal *in presenti* with matters then in existence, under the designation of "said invention," as follows:

"Now, therefore, be it known \* \* \* I, Thomas A. Edison, do \* \* \* hereby assign, set over and convey to him, said Harrington, two-thirds, in interest, of all my said inventions, including therein all my inventions of mechanical or copying printers, and of all the patents for all such inventions and printers whether already issued, applied for, or to be hereafter applied for, and of all and whatsoever of my inventions and improvements, made or to be made, *that are or may be applicable to automatic telegraphy mechanical printers.*"

This is the substance of that part of the paper which operates as a conveyance. It will be seen that its language is appropriate for a case in which inventions *had already been made*, in pursuance of such a prior arrangement as is described in the recital clause; and its language is apt for the instant conveyance of *such* existing inventions, with the addition of a stipulation to convey, in future, *certain other specified improvements*, to wit: "improvements made or to be made, that are or may be applicable to automatic telegraphy mechanical printers."

Upon this paper as it reads, Harrington could not justly claim from Edison an interest in any invention, not complete at the making of the agreement, *except* inventions relating to the mechanical printers used in automatic telegraphy. It will also be seen that the whole contract is limited to either the "Little" system, or any other system of automatic or fast telegraphy, and to certain printers useful in that system of telegraphy; which printers are, by a phrase which perfectly distinguishes them, called "Automatic telegraphy mechanical printers."

It is understood that Harrington's claim is based solely upon a reading, or rather misreading of these words: "Little's system, or other system of automatic or fast telegraphy," which distributes them into three groups, representing three different sys-

tems (instead of one) which may stand and be operated independently of each other, namely:

- (1.) The Little system.
- (2.) Automatic system.
- (3.) Other fast system.

These terms must have a *reasonable* construction. The object of the construction is to ascertain the meaning of the parties *at the time they made use of the terms*.

In 1871, the term "Automatic or fast telegraphy" had already taken a firm hold in the literature of the telegraph, and had extended into common use; but at that time it is believed that the term "Duplex" was entirely unknown, at least outside of the Patent Office, and that the term "Quadruplex," as applied to telegraphy, was wholly unknown; that neither of them had ever been applied to indicate any "system" of telegraphing, and that they are wholly inapplicable, at the present time, to indicate any system. The term "Automatic," or its synonym "fast," does in fact describe and convey to the minds of persons acquainted with such matters, an idea of a complete and new system. The duplex and quadruplex are merely methods of transmission applied to the Morse system.

It not being claimed that the inventions in question come within the "Little" system, or "Automatic" system, or any "fast" system, known in 1871, the only claim to be made is that they constitute by themselves a fast system, and are an "other fast system."

The duplex and quadruplex do not turn the Morse system into a fast system, since messages can be sent no faster by their aid than before.

No increase of speed is obtained by their use, but an increase of capacity in the wire, to receive and transmit (at the old rate of speed) more than one message is obtained. In short, the multiplex is a *method of transmission* by which an operator is enabled to send his message without excluding another message from occupancy of the wire at the same time. It is not a fast system, because by its aid one sender and one receiver can transmit no more than about forty words per minute, which is the rate of the ordinary Morse instrument. By the Automatic system it is claimed that one sender and one receiver can transmit one thousand words per minute, which, being so, constitutes it, unquestionably, a fast system. The Morse system, aided by the duplex or quadruplex instruments, is a "fast system" precisely as a railroad train running at a uniform rate of speed is made faster or slower, according to the number of cars it contains, or the number of passengers it transports.

If the Erie Canal should be widened so as to accommodate ten boats abreast would it be a faster mode of travel than now? Is a horse race in which ten horses run the course together in ten minutes faster than a race over the same course, which is run by another and fleetier horse in two minutes?

It seems that counsel ought not to be called upon to discuss, nor required to occupy the attention of the Commissioner with the hearing of arguments upon a point so palpable as this.

The following extended extracts from public journals and books relating to "fast" telegraphy, and the various forms of the multiple method as well as from the contracts of Harrington himself, make a demonstration as utterly conclusive as is possible upon any question, that the term "fast telegraphy" is a synonym for, and by common acceptance includes and is limited to "Automatic telegraphy." The term "fast" is evidently a *descriptive epithet* intended, by its *unisolated association with the appropriate scientific*

term "Automatic," to emphasize what its friends consider the distinctive merit of the Automatic system.

So extended has been this use of the word "fast," and so complete the acquiescence of the newspapers and the public, that if it were a case of trade-mark, under the common law, the owners of the Automatic system would have a good ground for restraining the use of the term "fast" telegraphy, even by the owners of some new system of greater speed.

The general literature of the art discloses the difference between the automatic and the duplex systems, and the fact that the facility for rapid signaling afforded by the automatic system became its distinctive characteristic and led to its being familiarly called the "fast system."

Hence the use of the words "automatic" and "fast" as synonyms by Edison and Harrington, in their agreement of August 4, 1871, and the like use of similar terms by Harrington and Little in their agreement of September 22, 1871, and by George Little, in his letter of October 15, 1874, to William Orton, and by George Harrington, in his circular to the public of January 28, 1874, is proved to be the only use of those words, in connection with telegraphy, which is justified by and in keeping with common and long-continued usage.

That the "automatic or fast" system is one thing and the system of multiple transmission is another thing, is illustrated by the fact that both systems, if desired, may be used together. That is to say, several messages may be simultaneously transmitted by the simultaneous operation of several automatic signaling machines, thus adding the element of "fast" to the element of multiplicity.

The wire upon which the electrical current travels in one direction, and the earth, through which the current returns to its starting-point, may be likened to a double track railroad. The performance of a given amount of transport service by means of a train run at a speed of fifty miles an hour would be properly referred to as exhibiting a fast system of railroading. But the same volume of service could be performed by five trains of like capacity running at the rate of only ten miles an hour. To call the latter a fast system of railroading would be obviously absurd. Nevertheless, the fast system might be applied to the five trains by giving them all the speed of fifty miles an hour, just as the fast system of telegraphy might be adopted for the simultaneous transmission of several messages by substituting automatic or mechanical signaling for the hand-signaling of the several operators.

V.—The suggestion of issuing patents to Edison alone cannot be defended. His double-dealing has given rise to his complication. Neither his personal action, nor the merits of Mr. Jay Gould, his attorney irrevocable, appear to point them out as persons specially trustworthy to hold title for others. Mr. Prescott, the only person who is, without dispute, entitled to some share in the monopoly, should not be excluded from the Letters Patent, and be thus put to demand another assignment to restore him to his rights. In *Gaylor vs. Wilder*, the Supreme Court, after holding that an assignment of the invention before issue of Letters Patent, passed a legal title to them upon issue, the issue having been *improperly made* to the inventor, instead of to (the assignee), said: "We are the less disposed to give it" (the assignment) "any different construction, because *no purpose of justice* would be answered by it," p. 493; and further: "Fitzgerald sets up no claim against the assignment, and *to require another would be mere form*," p. 494.

In this case Edison sets up no claim against the assignment to Prescott. It is Harrington who sets up

a claim adverse to us. Edison's letter referring to his "misapprehension," and his futile effort to withdraw a request (made on good and indefeasible consideration), do not tend to impeach the assignment as between himself and Prescott. Even if Harrington is held the owner of two-thirds, the assignment is still good to take from Edison *all the interest he has remaining*. That Prescott is the only person who is, without dispute, the owner of *some* interest in the patents to be issued will appear by considering, as is done below, the state of each claimant's title:

1st. As to Harrington. Prescott disputes the asserted effect of the Edison assignment to Harrington of two-thirds, and the decision of the Commissioner, or of a court, may declare Harrington to be totally *without interest*.

2d. As to Edison. Edison professed to have assigned to Harrington two-thirds. If this is so, he is therefore one-sixth overdrawn, and must be held to be totally *without interest*.

3d. As to Prescott. If Prescott's own theory is right, he is the owner of half. If Harrington is right, Prescott (having been assigned one-half of the whole) will take the remaining one-third (being all he can get). If Edison is right in his construction of his agreement, still Prescott has one-third; or if he should attempt to claim that he assigned only one-half his interest, that being one-third, Prescott has still one-sixth. Thus Prescott is the only person who, in all events, must be held to have *some interest*.

The Commissioner ought to issue Letters to Prescott and Edison, leaving Harrington to bring his suit against them as his trustees.

1st. Because the title is safe in them, by force of their agreement on record. Harrington will (he and Edison being in confederation) find the title intact when he wants to bring suit.

2d. Because if given to Edison alone, the state of the record title favors the granting of assignments or licenses behind our backs by himself or his attorney, Jay Gould, which we might not be able to prove were not in good faith, and which would at least needlessly complicate matters, and cause useless expense.

3d. Because, if issued to Edison alone, a suit must be instituted to substitute some one with him.

Certainly Prescott will be put in with him for some interest.

Perhaps Harrington and Prescott may oust him altogether.

If Prescott is put in now, the simple question for litigation will be, who is his partner; and that suit would be prosecuted at the expense of the parties who are the real contestants upon the material question whether they have *any* interest, and not that of the party as to whom the only question is, what the extent of his admitted interest.

It seems absurd, therefore, to leave out the only man who must be put in hereafter.

4th. Because the only specific assignment on record is that to Prescott. No question of fact is raised, or need be determined, to enable the Commissioner to know that the inventions in question are the very ones named in his assignment, and at the time of its delivery intended to be covered by Prescott's assignment; and while it is certain that Edison intended to convey an interest in these inventions to Prescott, the utmost that can be said for Harrington's claim is that an ingenious construction may perhaps raise some doubt whether he did not intend to convey an interest to Harrington.

On the other hand, to decide in favor of Harrington, makes it necessary to try two important ques-

tions, which can nowhere be perfectly tried except in a court.

1st *Question of Law*.—Is the writing of 1871 an assignment at all, capable to pass the legal title to specific inventions, or capable to do more than give a cause of action for damages or specific performance if the title remains (as is not the case) capable of being conveyed intact by the contracting party?

NOTE.—It seems H. and E. have so construed that paper since they have passed and recorded a specific assignment for each invention as it was born.

2d *Question of Fact*.—Whether, considering the paper in proper form to operate as an assignment, patents in question are, in fact, within the description of inventions which it purports to convey?

VI.—Letters Patent should issue to Edison & Prescott, in accordance with their joint request of Aug. 19, 1874.

J. HUBLEY ASHTON,  
GROSVENOR PORTER LOWREY,  
ROSCOE CONKLING,

*Counsel for the Petitioner,*  
George B. Prescott.

#### DECISION OF THE COMMISSIONER.

In the matter of the applications of Thomas A. Edison, assignor, &c., Nos. 94, 95, 96, 97, 98, 99 and 100, for Letters Patent for alleged "Improvement in Duplex Telegraphs," filed September 1, 1874.

Prior to the filing of these applications the following assignment was sent to the Patent Office, and recorded August 29, 1874, in Liber K<sup>18</sup>, p. 62, Transfers of Patents:

#### ASSIGNMENT—EDISON TO PRESCOTT, DATED AUGUST 19TH, 1874.

Articles of agreement made and entered into this nineteenth day of August, A. D. 1874, by and between Thomas A. Edison, of Newark, in the State of New Jersey, and George B. Prescott, of the City and State of New York,

Witnesseth: Whereas said Edison has invented certain improvements in duplex telegraphs for which he has executed, or is about to execute, applications for Letters Patent of the United States, and such applications are numbered 94, 95, 96, 97, 98, 99 and 100, and are dated August 19, 1874, and said Prescott is entitled to an equal interest in the same and others hereafter mentioned.

Therefore, in consideration of the premises, and the sum of one dollar in hand paid, the receipt whereof is hereby acknowledged, the said Edison has sold and assigned, and does hereby set over and convey unto the said George B. Prescott, one undivided half part of the right, title and interest, of every character, in, to, under, and connected with, each and all the aforementioned inventions and Letters Patent on the same, when granted, and authorizes and requests the Commissioner of Patents to issue the said Letters Patent to Thomas A. Edison and George B. Prescott, as the assignees of said Edison, for the use and behoof of themselves, and their legal representatives. And whereas the said Edison has also invented other improvements in duplex telegraphs, the descriptions of which have been lodged with George M. Phelps for the purpose of models being constructed, it is hereby agreed that such inventions are included in this present agreement, and that, when the applications for patents are made, the patents to be granted in accordance herewith, and that the said Edison shall sign the required papers therefor.

In accordance with this assignment, the applications were entered in the Office as made by "Thomas

A. Edison, assignor of one half his right to George B. Prescott, of New York City," and under the usual practice of the Office, the patents would be issued, in accordance with the request contained in the assignment, to Edison & Prescott, as assignees of the former. Before the examination of the applications had been completed, George Harrington presented to the Commissioner of Patents a petition bearing date January 23, 1875, praying that the patents might issue to Edison and himself, as assignee of the former, on the ground that the following assignment, recorded May 6, 1871, *Liber U13*, p. 412, Transfers of Patents, conveyed to him an interest in these inventions.

**AGREEMENT—EDISON AND HARRINGTON, DATED APRIL 4, 1871.**

Whereas, I, Thomas A. Edison, of the City of Newark, State of New Jersey, for certain valid and valuable considerations to me in hand paid, and in further consideration of certain covenants and stipulations to be fulfilled by George Harrington, of Washington, District of Columbia, did stipulate and agree to invent and construct for the said Harrington full and complete sets of instruments and machinery that should successfully and economically develop into practical use the Little or other system of automatic or fast system of telegraphy, and subsequently to improve and perfect such instruments and machinery by adding thereto from time to time such further inventions as experience should demand and my ability as an inventor and electrician might suggest and permit, and furthermore, to prepare or cause to be prepared the necessary description papers, the model and drawings requisite to obtain patents for all such inventions and improvements, the said inventions and improvements to be the joint property of the said Harrington and myself, and the patents to be issued to the said Harrington and myself in the proportionate interest of two-thirds to said Harrington and one-third to myself; the whole to be under the sole control of said Harrington, to be disposed of by him for our mutual benefit in the proportions hereinbefore recited, in such manner and to such extent as he, the said Harrington, should deem advisable, with power to sell, transfer and convey the whole or any part of the rights and titles in and to any or all of said inventions and improvements, as also of the patent or other rights arising therefrom. And the said Harrington having faithfully fulfilled all of the covenants and stipulations entered by him:

Now, therefore, be it known that, in consideration thereof and of the sum of one dollar to me in hand paid, I, Thomas A. Edison, of the City of Newark, State of New Jersey, do, by these presents, hereby assign, set over and convey to him, the said Harrington, two-thirds in interest of all my said inventions, including therein all my inventions of mechanical or copying printers, and of all the patents for all such inventions and printers, whether already issued, applied for, or to be hereafter applied for, and of all and whatsoever of my inventions and improvements made or to be made, and of all the patents that may be issued therefor, that are or may be applicable to automatic telegraphy mechanical printers.

A letter of even date was also received from Edison, stating that the assignment to Prescott was made under an erroneous impression, and requesting the issue of the patents to Harrington and himself.

The issue before the Commissioner is, to whom shall the patents be granted. In determining this ques-

tion the Commissioner must be guided entirely by the record. He has not the authority of a court to go outside the record to consider evidence as to outstanding equities. The only question that he can decide is, who on the record possesses the legal title to these inventions? He must issue the patents accordingly, if the requirements of the Office in such cases provided have been complied with.

In the investigation of this matter, I have come to the conclusion that it is not necessary for the Commissioner to determine whether the assignment from Edison to Harrington, dated April 4, 1871, covers these inventions or not. However, this question may be determined, finally, there is no evidence that the inventions described in these applications were in existence at the time this instrument was executed. This is not even claimed by Harrington; he has simply said that there is no evidence that they were not then in existence.

But in a Court of Equity, one of the first requirements made of Harrington would be to prove affirmatively that Edison had perfected these inventions, when he executed the assignment of April 4, 1871. In the absence of such proof the probabilities must guide. These are all against the existence of the inventions at that time. The applications were filed more than three years after the date of the assignment. The first record made by Edison in the Patent Office in any way connected with these inventions was some time in 1873, when he signed his first caveat relating to duplex telegraphy. It is also worthy of notice in this connection that Edison is a very fertile inventor, as the great number of patents obtained by him within the last few years conclusively shows. These applications extend a series, commenced not long ago, to the number of one hundred. It must be remembered, too, that there has been great activity in inventions relating to telegraphy for a number of years past, and sharp competition has existed between inventors of various improvements. It is incredible, under these circumstances, that an inventor like Edison would allow such valuable improvements to lie three or four years after completion without applying for patents. In the absence of positive evidence on this point, I must follow the presumption, which is so strong in this instance as to amount almost to a certainty, that the inventions described in these applications were not *in esse* when the agreement was made between Edison and Harrington. If, then, this deed included these inventions in unmistakable terms, no legal title in them passed thereby to Harrington; the instrument can have the force of an executory contract only.—(*Gibson vs. Cook*, 2 Blatf. 144; *Curtis on Patents*, 4th Ed., sec. 183, N. 2, p. 206.)

The legal title to these inventions, then, was entirely in Edison at the time he executed the assignment to Prescott, and he alone had the right to convey any interest in the inventions or patents granted therefor. This right he exercised with all due formality when, in 1874, he conveyed an entire half interest in the inventions to Prescott. Whether this was done in violation of an outstanding contract is not material to the present discussion. Prescott became the legal assignee of Edison, and, upon the execution of the assignment of 1874, Edison and Prescott became the possessors of the legal title to the entire inventions.

Edison is now estopped from contradicting his deed of assignment to Prescott. It is hardly necessary to cite authorities on this point, and I will only refer to *Rensselaer vs. Kerney et al.*, 11th How, 297, and *Bowman vs. Taylor*, 1 Webster's Patent Cases,

292. It may be alleged, however, that the same doctrine should be applied to the deed of Edison to Harrington of 1871, and that then the rule that an "estoppel against an estoppel setteth the matter at large," would operate. But an estoppel arises alone upon a recital of a particular fact. "There is," said Lord Tenterden, delivering the judgment of the Court in *Doe d. Jeffreys vs. Bucknell*, Q. B. and Ad., 278, "a want of that *certainly of allegation* which is necessary to make it (the deed) an estoppel." Lord Holt lays it down, in *Selby vs. Ridley*, 1 Show., 59, that *general recital* is not an estoppel, though recital of a particular fact is. *Doe vs. Oliver*, 2 Smith's Leading Cases; *Howe and Wallace's Notes*, 7th Ed., 610.

The deed in question contains no recital or description whatever of any particular invention or patent then in existence. It is vague in its terms, and executory in its nature, and, for the latter reason, as well as for its uncertainty, an estoppel cannot be considered as arising thereupon. (*Doe vs. Oliver*, *ibid*, 620.)

The discussion of this case might rest here, I believe, with perfect certainty that if the necessary formalities have been observed the Commissioner must necessarily order the patents to issue to Edison and Prescott. But I am still more strongly confirmed in this opinion by the fact, as I believe, that Prescott is the owner of some interest in these inventions, whatever effect may be given to the Harrington contract. If a Court of Equity shall hereafter carve out a two-thirds interest in the patents granted and give it to Harrington, the deed of Edison to Prescott will still take effect upon the lesser interest if the grantee chooses to enforce it. (1 Sugdon on Vendors, 349; *Brown vs. Jackson*, 8 Wheaton, 453; *Waters vs. Travis*, 9 Johns., 450; *Turnbull, et al. vs. Weir Plow Co.*, 7 O. G., 173.)

Whether in this contingency, Prescott can enforce the contract to the full extent of the one-third interest remaining in Edison, or whether the terms and conditions of the grant are such that it can be enforced only to the extent of one-half Edison's remaining interest, is not material to this discussion. Upon the record before me, Prescott, in my opinion, has an indefeasible right to some interest in the inventions described in these applications. This fact makes the necessity of joining Prescott with Edison as the sole possessors of the legal title to the inventions still stronger.

The only question left is to determine whether the assignment to Prescott is in such form as to authorize the Commissioner to issue the patents to Edison and Prescott as assignees of the former. On this point it is only necessary to say that the assignment is in the very words of the form which has been sent out by the Patent Office for years past in its yearly official edition of Rules and Practice. The practice has been invariable for years past to issue patents to the assignees whenever assignments in this form are put on record prior to the issue. I see no reason whatever for departing from this rule in this instance. In the absence of any decision by a higher tribunal invalidating patents thus granted, I think the Commissioner should follow the practice which, so far as my knowledge extends, has never been questioned heretofore.

The applications are remanded to the principal Examiner, and the patents will issue to Edison and Prescott as assignees of Edison.

JNO. M. THACHER,

Commissioner of Patents.

March 20, 1875.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, April 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Oxford, Ala., closed.  
Messages taken for Union City, Conn., are delivered from Naugatuck. Charges for delivery, 30 cents.  
Farndale, Ill., reopened.  
La Crosse, Ind., reopened.  
Lafayette, La., reopened, square 335.  
The P. O. address of Lyons Point, La., is Rose Bluff.  
Aurora, Mo., closed.  
Billings, Mo., reopened, square 439.  
Oregon, Mo., closed.  
Gallatin, Mont., closed.  
Berton, N. B., closed.  
Verbank, N. Y., closed.  
Dexter City, O., reopened.  
Aladdin, P., reopened, square 131.  
Blue Ridge, Pa., closed.  
Ireland, Pa., closed.  
New Philadelphia, Pa., closed.  
Temperanceville, Pa., closed.  
The P. O. address of Troy, Jefferson Co., Pa., is Summerville.  
The P. O. address of Du Bois, Pa., is Rumburg.  
Messages taken for McIntyre, Pa., are delivered from Ralston. Charges for delivery, 50 cents.  
Assamiquagan, Que., reopened, under the name of Mill Stream.  
Mt. Juliet, Tenn., closed.  
Highland, Texas, reopened, square 432.  
Palmer, Texas, reopened, square 511.  
Elizabeth, W. Va., reopened, square 171.

## NEW OFFICES.

334 Grand Bay, Ala.  
\* Camp Lowell, Arizona. 100 8 from San Diego, Cal.  
246 Bartow, Ga.  
336 Sparland, Ill.  
271 La Fontaine, Ind.  
335 Bayou Boeuf, La.  
335 Bayou L'Ours, La.  
\* Fells Point, Baltimore, Md. 15 1 from Baltimore.  
85 New Windsor, Md.  
408 Coatesville, Mo.  
447 Last Lynn, Mo.  
4 Nauwigewauk, N. B.  
Passekeag, "  
4 Lepreaux, "  
Bushwick, L. I., N. Y.; tariff same as Brooklyn. Check Brooklyn.  
74 Skaneateles Falls, N. Y.  
\* Shekomeko, N. Y. 30 2 from Fishkill.  
41 Kingsland, N. J., check Hoboken.  
231 Neapolis, Ohio.  
\* Foxboro, Ont.  
\* St. Simon, Que.  
\* La Prairie Junction, Que.  
\* Mill Stream, Que. (formerly Assamiquagan.)  
588 El Sauz, Texas.  
103 Summit Point, W. Va.

Business for the following offices (named, with rates, from Chicago, Ill., in JOURNAL of January 15, 1875) may be sent and checked to Deahler, O., at the rates here given for other lines:

Baltimore Junc., Ill.	65 4
Kingston, Ill.	65 4
Albion, Ind.	55 4
Avilla, Ind.	55 4
Bremen, Ind.	60 4
Cromwell, Ind.	60 4
Garrett, Ind.	50 3
Suman, Ind.	65 4
St. Joe, Ind.	40 3
Chicago Junc., O.	50 3
Hicksville, O.	40 3
New Baltimore, O.	25 3
Republic, O.	45 3

## ATLANTIC CABLE BUSINESS.

We are notified that the cable between Pernambuco and Para (South America) has been repaired.

WILLIAM MORTON,  
President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 74, ISSUED MARCH 29, 1875.

## Death of William F. Muchmore.

William F. Muchmore, of Astoria, L. I., (Certificate No. 715, issued January 26, 1870,) died at Astoria, March 11, 1875, of pleura-pneumonia.

One dollar for assessment 74 is due from members holding certificates numbered up to and including No. 2,414.

## RECEIPT OF ASSESSMENTS.

NEW YORK, March 25, 1875.

## ASSESSMENT No. 73.

5, 13, 22, 25, 26, 33, 45, 53, 55, 56, 72, 74, 75, 89, 97, 99, 101, 103, 114, 120, 129, 140, 143, 154, 156, 158, 160, 164, 169, 182, 183, 184, 189, 190, 191, 193, 197, 198, 218, 227, 230, 237, 273, 279, 281, 282, 283, 285, 341, 350, 353, 356, 357, 361, 362, 364, 366, 372, 373, 381, 382, 391, 394, 411, 412, 416, 426, 441, 484, 490, 495, 499, 506, 507, 508, 511, 512, 516, 526, 533, 556, 559, 574, 584, 590, 600, 642, 645, 648, 649, 659, 671, 678, 680, 694, 701, 703, 708, 714, 733, 733, 734, 735, 739, 734, 759, 772, 780, 790, 791, 803, 808, 809, 812, 820, 823, 825, 870, 883, 897, 901, 905, 922, 929, 931, 938, 942, 943, 949, 954, 957, 959, 963, 964, 976, 977, 979, 980, 991, 992, 1000, 1002, 1005, 1011, 1080, 1081, 1083, 1084, 1046, 1047, 1050, 1074, 1076, 1080, 1081, 1085, 1088, 1090, 1100, 1101, 1104, 1139, 1143, 1149, 1152, 1164, 1167, 1190, 1191, 1200, 1205, 1210, 1211, 1226, 1227, 1234, 1237, 1238, 1245, 1251, 1259, 1266, 1268, 1269, 1270, 1274, 1277, 1288, 1290, 1292, 1294, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1353, 1353, 1354, 1355, 1356, 1359, 1366, 1376, 1406, 1407, 1415, 1417, 1426, 1427, 1430, 1444, 1448, 1451, 1454, 1455, 1458, 1457, 1458, 1481, 1482, 1483, 1490, 1498, 1503, 1505, 1506, 1507, 1508, 1513, 1523, 1524, 1527, 1542, 1546, 1553, 1560, 1573, 1576, 1586, 1620, 1625, 1626, 1633, 1634, 1637, 1680, 1661, 1663, 1663, 1665, 1666, 1667, 1672, 1677, 1681, 1686, 1697, 1698, 1712, 1714, 1723, 1732, 1733, 1737, 1743, 1744, 1745, 1765, 1766, 1767, 1775, 1785, 1788, 1789, 1800, 1818, 1830, 1837, 1838, 1844, 1845, 1857, 1858, 1859, 1860, 1864, 1869, 1874, 1876, 1877, 1889, 1900, 1907, 1915, 1916, 1942, 1957, 1958, 1964, 1973, 1973, 1991, 1992, 1993, 1996, 1997, 1999, 2000, 2001, 2007, 2010, 2012, 2022, 2025, 2029, 2033, 2035, 2036, 2048, 2050, 2053, 2061, 2065, 2074, 2075, 2086, 2092, 2103, 2108, 2113, 2118, 2120, 2121, 2122, 2123, 2124, 2126, 2127, 2143, 2143, 2145, 2147, 2150, 2154, 2156, 2157, 2159, 2164, 2167, 2169, 2175, 2181, 2187, 2191, 2192, 2196, 2197, 2200, 2201, 2202, 2215, 2216, 2217, 2220, 2225, 2230, 2231, 2237, 2245, 2246, 2251, 2253, 2253, 2253, 2261, 2263, 2268, 2271, 2274, 2275, 2276, 2277, 2278, 2288, 2293, 2299, 2300, 2302, 2304, 2307, 2321, 2323, 2324, 2327, 2351, 2352, 2357, 2358, 2359, 2361, 2363, 2366, 2371, 2373, 2380, 2381, 2384, 2385.

## ASSESSMENT No. 72.

2279, 2281, 2282, 2283, 2318.

## ASSESSMENT No. 71.

185, 186, 187, 330, 429, 496, 497, 500, 503, 508, 695, 697, 705, 1071, 1155, 1156, 1157, 1159, 1160, 1163, 1185, 1400, 1504, 1553, 1557, 1570, 1613, 1644, 1670, 1741, 1881, 1908, 1945, 1946, 1947, 1987, 2115, 2150, 2151, 2236, 2308, 2306.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## TRANSFER SERVICE.

## EXECUTIVE OFFICE,

NEW YORK, March 23, 1875.

On and after April 5th, Jacksonville, Fla., will be added to the list of money order offices in J. A. Brenner's district.

GEO. H. MUMFORD,

Vice-President.

## EXECUTIVE OFFICE,

NEW YORK, March 27th, 1875.

To all Transfer Agents:

Mr. S. S. Garwood, of Philadelphia, has been appointed Transfer Agent for the District heretofore in charge of Mr. D. H. Bates, dating from the 1st day of April next.

GEO. H. MUMFORD,

Vice-President.

## OBITUARY.

M. ABEL GUYOT.

The death, at Havre (France) on the 9th of February, of M. Abel Guyot, Inspector of the French Telegraphs, is announced.

M. Guyot entered the telegraph service in 1853 in a very humble capacity, and by merit alone advanced through all the intermediate grades to the position he occupied at his death. He was Secretary of the *Commission de Perfectionnement*, and wrote their reports upon the various subjects investigated by them, a labor that could be performed only by a thorough electrician. This commission embraced some of the most eminent of French electricians, including Gaign, Blavier, Du Moncel and others.

It was his report upon batteries that brought to notice the Callaud and its subsequent adoption in France. The first Callaud pattern of the plates that came to this country was sent by him, and his report, which appeared in the *Philosophical Journal*, was the first introduction of that battery in this country.

On account of his able management of the telegraphs, including the Semaphoric system, during the siege of Havre by the Prussians in 1872, he was decorated with the ribbon of the Legion of Honor, an honor that is conferred only in acknowledgement of the most undoubted merit.

M. Guyot was a gentleman of high attainments, and a member of many of the societies of learning and science.

## DISTRICT TELEGRAPH COMPANY IN SAN FRANCISCO.

Articles of incorporation of the American District Telegraph Company were filed March 5th, in the office of the County Clerk, at San Francisco, California. The Directors are George S. Ladd, James Gamble, Monroe Greenwood, Stephen D. Field and Jas. T. Boyd. The capital stock is \$125,000, divided into 1,250 shares of the par value of \$100 each. It is intended to establish in the city several districts, and to have a central office in each. The estimated length of the telegraph lines is one hundred miles. The amount of capital stock actually subscribed is \$50,000.

## OPERATOR MCCLELLAND RELEASED.

John L. McClelland, the telegraph operator who was convicted of criminal negligence in allowing two trains to collide at the Bergen Cut of the Pennsylvania Railroad, has been discharged from jail, the Board of Chosen Freeholders of Hudson County, New Jersey, having remitted the fine of \$250 imposed on him. His counsel paid the cost of the prosecution. By the collision two men were instantly killed and one seriously injured.

## PROJECTED FIRE ALARM TELEGRAPH.

A proposition to establish a line of fire alarm telegraph from Port Richmond, Staten Island, through New Brighton and across the island, through Edgewater to Forts Wadsworth and Tompkins, with alarm bells located in the three incorporated villages named, is now being discussed with considerable favor.

The members of the telegraphic staff of Cuba and Puerto-Rico have addressed a memorial to the Minister for Transmarine Affairs, complaining that vacancies arising in those islands are supplied by telegraphists from Spain, and that thus their prospects for promotion are practically extinguished.

## CORRESPONDENCE.

## AN EASY WAY TO COPY MESSAGES.

To the Editor of the Journal of the Telegraph:

All that is required to take a good legible copy is good copying ink and the copying paper furnished by the Western Union. Dampen a sheet of paper and lay on the written message and press down with a towel, handkerchief, or even the palm of the hand.

This plan will be found to work well at any office where there are but few messages received. I have been copying all my messages in this way for the last six months, and find I can take as good a copy as if I used a regular copying press. W.

To the Editor of the Journal of the Telegraph:

1. Suppose two wires, worked from the same battery, at the termini, to be escaped, could a better working wire be obtained by throwing the two wires into one circuit, using the ground for a return circuit, as in the case of a single wire, and the same battery that formerly supplied them singly? Or would the combined conductivity of the two wires, thus practically converted into one, be counteracted proportionately by the increased resistance? If so, why is "doubling," as I heard a telegrapher style it, resorted to, as I understood him to say he had known it to be between large offices? Imagine the circumstances were favorable, suppose there to be no escape on the two single wires, what would be the effect of "doubling" them?

2. Where can I procure an explicit explanation of Stearns' duplex instruments? A reply through the JOURNAL would very much oblige C.

*Answer*—1. It is often possible to work two wires as one by connecting them in this manner, when it would not be possible to work either one alone. The increased conductivity could not be "counteracted by the increased resistance," for the reason that resistance being the converse of conductivity, an increase in the latter necessarily involves a decrease of the former. The joint resistance of two similar parallel wires is only half as much as those of either one alone.

Suppose that 90 per cent. of the current in each wire escaped through defective insulation, leaving but 10 per cent. available for operating the receiving magnet. If the two wires were coupled together, we should get 10 per cent. of current from *each* wire in the instrument, making 20 per cent., and our correspondent will readily see that the latter amount of current might work an instrument, when the former amount would not.

If there were no escape on the wires, "doubling" them would practically double the current in the receiving instrument, supposing the internal resistance of the battery to be small in proportion to the resistance of the line, as it usually is.

2. Description of the Stearns duplex will be found in the JOURNAL OF THE TELEGRAPH, Vol. VI., pp. 241, 289.

THE Central American Telegraph Company announce that they have received information to the effect that the line from Para to Ceyenne and Demarara, as also the lines from Trinidad to Saint Croix and Porto Rico, have been successfully completed, thus giving direct telegraphic communication between Brazil, the West Indies and North America. These lines will, in accordance with agreements, become the property of the West India and Panama Company.

## THE ANGLO-AMERICAN TELEGRAPH COMPANY.

The announcement made by the directors of this company of their intention to reduce the present rate of 4s. to 2s. per word is undoubtedly a step in the right direction. The directors have shown commendable caution in the course which they have adopted of making gradual reductions in the rate. Having created a demand for transatlantic telegraphy which is already far in excess of the original estimate of the promoters of the undertaking, the company, with this ample experience in the working of their lines, are fully justified in their endeavors to attract additional business. How far they may have been urged to their present decision by the prospect of competition it is not necessary to inquire; it is sufficient to say that the company, having now four cables at work, with a carrying capacity greatly in excess of the messages actually conveyed, they are in a position to offer facilities for speed, punctuality and accuracy which no competitor can hope to rival for many years to come. It is certain that a company possessing such great facilities for the transmission of messages, is in a position to give the public the full benefits of cheap telegraphy without being incited thereto by competition. So far as the public are concerned, they derive no real benefit from competition; additional cables represent additional capital, and upon this increased capital dividends have to be paid which absorb their portion of the earnings, and really prevent the reduction which it is the professed object of competition to establish. Competition, in fact, always has and always will end in combination. The French cable is now amalgamated with the Anglo-American, and its capital has helped to swell that of the Anglo to its present amount. Take, as an illustration of the tendency of competition to defeat its own object, the cases of the South-Eastern and the Chatham and Dover Railways. In the case of these companies we find that Dover, provided as it is with two railways, has less facilities offered for traffic than between London and Brighton, which has only one railway. The Anglo-American has been for some time threatened with the competition of a direct cable, but the company promoting that concern are still struggling with the difficulties which they had underrated, and with which they have shown themselves incompetent to grapple successfully. Practically, therefore, the Anglo-American Company possess and must continue to have the control of the business which was created by their enterprise and perseverance.—*The Railway News*.

## TELEGRAPH SECURITIES IN LONDON.

Mr. William Abbott, of Token-house-yard, in his Monthly Circular of March 1st, has the following with respect to Telegraph Securities:—"Several important events affecting telegraph property have occurred during the past month. The announcement by the directors of the Anglo-American Company that it is their intention to limit the distribution of profit on account of the past year to 5 per cent., without at the same time stating the amount of revenue earned and the balance carried forward and reserved, has given rise to comment almost approaching to discontent. The shareholders of this company have at all times so loyally supported the administration that this feeling is to be regretted. In any undertaking earning a revenue the extent of which is ascertained weekly, if not daily, there should be no attempt at mystification. The recent chilling announcement of the Anglo-American Board was specially unjustifiable, seeing that at the time

it was made the total revenue of the year was known, and that exceptional reserves had been made as a matter of policy. Had this fact been also publicly announced, the shareholders would, I am sure, have heartily endorsed it, and instead of the effect being to depreciate the value of the property, it would rather have tended to strengthen it. It is, therefore, but natural that an influential body of proprietors should have combined for their own protection, and signed a requisition to the directors with a view to the division of their investment into preferred and deferred stocks, so that should stocks occur in future only one-half, instead of the whole, of their property would be affected. When the stock is divided the proprietors can easily protect the one-half, which takes the reversion of their income, the other having been rendered safe from speculative attack. It may be well to point out to the Anglo-American shareholders that the Globe scheme was formed with the special object of attracting to cable property a portion of the great class of investors whose primary object is freedom from violent fluctuation. The success already obtained by the Globe Six per Cent. Preference Shares, which steadily maintain their par value, justifies the expectation of a similar success for the proposal as regards the Anglo-American Company. For it must be remembered now that the latter have five separate cables, the stock offers the same grounds for division into Preferred and Deferred as does the Globe Company, which embraces the Eastern, Eastern Extension, and Brazilian and Anglo-American. Anglo-American shareholders would have no anxiety as regards the value of their Six per Cent. Preference Stock. At the lowest estimate it would command a par value of £100, and the Deferred portion—so great is the demand for speculative investments having the reversion of an active and living property—would rapidly rise to a level equivalent to that attained by the Globe Ordinary or deferred shares—viz., £82½ per £100 stock, thus giving an average value of £81½ to the Anglo divided as against £72 for the Anglo undivided stock. With reference to the policy of the Anglo-American directors in announcing the reduction of 50 per cent. in the tariff for messages, it is one which speaks well for their foresight. Having created out of revenue, and inside the capital of £7,000,000, a carrying capacity in excess of their requirements, they have now decided to try the experiment of diving down to the lower level, so as to tap fresh streams of traffic."

The cable steamer *Hooper* has successfully laid the cable between Trinidad and St. Croix, the insulation of which is reported to be superb.

Six wires, operated with Hughes' printing telegraph instruments, are now worked, connecting the London Stock Exchange and the Paris Bourse.

The Submarine Telegraph Company have declared a dividend for the six months ending December 31st, at the rate of 16½ per cent. per annum, less income tax, payable on and after March 31st.

The Telegraph Construction and Maintenance Company of London had constructed, at the close of 1873, 37 211 miles of telegraph cable, to which was added 5,973 miles laid in 1874.

It is not often that a telegraph ship has to pass the ordeal of a military bombardment. This has happened to the *Caroline*, while laying a short cable on the Spanish coast. The Carlists have driven her from her work, and she has since been engaged in repairing the Lizard cable.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

### TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, APRIL 1, 1875.

### THE QUADRUPLEX TELEGRAPH PATENTS.

We present in this issue some of the points in the able argument of Mr. Prescott's counsel before the Commissioner of Patents, together with the decision of that official, in the matter of the issuing of Letters Patent for the Quadruplex Telegraph. The great importance of these inventions, which are owned by the Western Union Company by purchase from the patentees, as well as the bold attempt to cause the patents to be issued to Harrington, who had no legal or equitable right to them whatever, make the case one of more than ordinary interest. The result of the hearing before the Commissioner is very gratifying to the friends of the Company as well as to all lovers of honesty and fair dealing.

OFFICES using a form of No. 4 Report, from which is omitted the number of sent collect half-rate messages, should supply the omission by writing it in when the report is made up.

The partial giving way last week of the ice gorges, consequent upon the breaking up of Winter, caused some damage to the wires running along the banks of the Delaware and the Susquehanna rivers. The ice having re-gorged, it is feared that further trouble will occur. Every precaution has been taken to meet it.

THE regular quarterly dividend of the Western Union Telegraph Company, two per cent., declared March 10th, is payable at the office of the Treasurer of the Company, Western Union Telegraph Building, on and after April 15th. The transfer books are closed until April 16th.

### MOVEMENT OF STORMS.

The weather reports have come to be a necessity of our daily knowledge. Scarcely does a *pater familias* open his morning *Herald* or *Times* or *Tribune* before the question comes from the better-half or some equally interested member of the family "how about the weather to-day?" and few are so indifferent on the subject as to lay down their morning paper without reading carefully the last words of "Old Prob." Whatever be the measure of its value either in commerce or to the household, these daily prognostications have become a part of the national food and indispensable to its mental composure and comfort.

We shall have however to advance a step farther. The telegraph has provided the means of watching the pathway of the storms which vex the year. We now need a better knowledge of this seemingly difficult field of inquiry. Where do storms arise? What is the law of their motion? Can they be arrested or broken? To Prof. Loomis we are already indebted for much valuable information on this subject. Thus he averages the momentum of storms throughout the year at 26 miles an hour, the most rapid in February, the slowest in August. Some storm centers remain stationary during 24 hours. In April, 1873, a storm in the Mississippi Valley moved in all directions in a single day. The average storm path is north of east; in Summer nearly due east; in Winter more northward. Rainfalls appear to influence most powerfully their velocity and direction. Such are some of the results of observation thus far.

The subject is interesting, but will not bear condensation. A larger comparison by telegraph of meteorological phenomena will undoubtedly lead to important knowledge on this subject. Men will have Nature's secrets some way or other. We dismiss the subject at present with the following brief statement of the general results of this telegraphic watch of the winds, and to which we are indebted to the same intelligent source. Storms are now graded into two classes. The first traverse the continent northward of the fortieth parallel. Many from the remote west show a preference for Lakes Superior and Huron and exhaust themselves there. Some of these are born in the Rocky Mountains, some in the lofty regions of Oregon. The second class originate chiefly west of the mouth of the Mississippi and move northeast. These comprise only about a sixth of the whole, but include some of the violent cyclones which traverse our coast.

In one other field the telegraph has yet to show its importance. The value of transit observations now depend on the synchronism of chronometers. The beat of the telegraph will make time at all places absolute. When observations are taken at widely separated points and the instant of transit is recorded by the throb of the telegraph we shall have some assurance of the accuracy of our observers.

### PRESIDENT ORTON'S VISIT TO EUROPE.

President Orton sailed for Europe on the steamer *City of Chester* on Saturday, March 27th, expecting to be absent for two or three months. Mr. Orton goes to London at the request and on the business of the International Ocean Telegraph Company, and is charged with the responsible duty of contracting for and ordering a new cable to be laid between Key West and Punta Rassa, and with an adjustment of the business relations of that company with companies operating connecting lines of cable in the West Indies, and extending to the Isthmus and to Brazil. It is expected President Orton will avail himself of the opportunity for a little rest and recreation in travel on the continent with his daughters, who accompany him on the trip.

### ILLUSTRATIVE.

In an editorial article recently published, the *New York Herald* makes use of the following language to illustrate its argument:

"The influence of a government upon the telegraphs has never received a better illustration than in the tone of the dispatches we have received from Spain since the accession of Prince Alfonso to the throne. As our readers will understand, the Spanish telegraph lines are under the complete supervision of the Home Department. If a dispatch is offered to an operator containing an allusion of a political character, or even an item of news, it is scrutinized by the officials and either amended or withheld."

Nothing can be more truthful than this illustration of governmental influence, not only in Spain, but in all other countries where the telegraph is controlled as a part of the political machinery of government. It would be the same in this country, only still more repugnant to the sense of the public, who would not regard with satisfaction the curtailment, amendment or suppression of any dispatch which they may desire to have transmitted.

### THE TELEGRAPHERS' CLUB.

In pursuance of the notice published in the *JOURNAL* of March 1st, some twenty-five or thirty operators and clerks met in the Auditor's office in the Western Union Telegraph Building on the evening of Tuesday, March 16th, and effected an organization under the name of "The Telegraphers' Club of New York and Vicinity." The objects of the Club are wholly of a social character. The officers are: D. W. McAneny, President; Thomas Brennan, first Vice President; E. A. Leslie, second Vice President; J. A. Ashurst, Corresponding Secretary; G. W. Sawyer, Financial Secretary, and James Lyman, Treasurer. There is also a board of nine Trustees.

A FIRE at Gloucester, Mass., last week, burned out the office of the Western Union Telegraph Company at that place. The instruments were saved.

## THE CASE OF MISFORTUNE.

The following additional subscriptions for the relief of the unfortunate operator in New Hampshire have been received at this office :

X. Y. and Z.....	\$2 00	R. B. White.....	1 00
A. H. Copeland...	1 00	Ed. A. Smith.....	1 00
J. L. Pringle.....	1 00		
Total.....			\$6 00
Previously acknowledged.....			\$428 50
Grand total.....			\$434 50

## SENATORS AS ATTORNEYS.

To the Editor of the Tribune :

SIR : This morning's *Tribune* contains an article entitled "Senators as Attorneys," in which it is stated that Senator Conkling lately appeared "before the Commissioner of Patents as attorney for the Western Union Telegraph Company." I understand the article to refer to my application for the issue of Letters Patent to myself and Thomas A. Edison for improvements in what is known as "duplex," or "multiplex telegraphy," which was opposed by George Harrington, and has been decided favorably to me. Whatever is the true view to be taken of the professional employment of lawyers, happening to be Congressmen, in cases not forbidden to them by the Act of Congress on that subject, or by any other law, it is of course desirable that the facts should be correctly stated whenever spoken of at all.

Senator Conkling was retained by me as my personal counsel, solely on account of his eminent legal ability, he being well known as one of the ablest lawyers in the country, and because I was advised by patent lawyers that he was pre-eminently qualified to discuss the important questions of law involved in this case. His argument fully justified my choice of counsel, whether the case had been decided in my favor or not. The Western Union Telegraph Company was not a party to the proceeding; but having a contract with Mr. Edison and myself for the purchase of these patents (which is now, however, denied by Mr. Edison), it directed its own regular counsel to aid me in the case so far as might be necessary to protect its own contingent interest. Senator Conkling appeared, however, for me alone, and his services have been paid for by me alone. Had he not been in Congress, or had the case been in any court where he practices, I should in like manner have sought his professional assistance.

Respectfully yours,

GEORGE B. PRESCOTT.

NEW YORK, March 27, 1875.

## MR. STEARNS COMPLIMENTED.

The *Telegraphic Journal* of March 1st, says :

"Mr. Stearns is in Paris, busily applying his duplex system to the Hughes printing apparatus, which is the favorite instrument in France—Morse being nowhere. He has been very successful between Paris and Versailles, Rouen and Havre. Mr. Stearns is sure to be successful anywhere, for he certainly is one of the ablest practical electricians of the day. It is very gratifying to see how his success, and that of his countrymen generally, fail to produce the smallest symptom of national jealousy in England. Truly in Telegraphy Anglo-Americans form but one nation."

The Spanish Minister of War is about to employ the nocturnal optical telegraph of D. Enrique Bonet in the campaign in the north.

## CABLE LEGISLATURE IN CANADA.

Mr. H. Weaver, the general manager of the Anglo-American Telegraph Company, has addressed the following letter to the London newspapers in reference to the injustice to that Company of the threatened legislation by the Dominion Parliament:

"ANGLO-AMERICAN TELEGRAPH OFFICE,  
London, March 6, 1875."

"SIR,—In the interests of the 6,500 stockholders of the Anglo-American Telegraph Company, I beg permission to call attention to the bill now in progress in the Dominion Parliament called 'A Bill to Regulate the Construction and Maintenance of Marine Electric Telegraphs.' This bill prohibits the construction, maintenance, or use of any telegraph cable upon the shores of the Dominion except by a company incorporated or specially authorized by the Canadian Parliament itself, or by Canadian charter, or the Legislature of some one of the provinces of the Dominion. This sweeping enactment is tempered by two provisions, the first of which declares that any existing telegraph company may continue to receive and transmit messages by its cable until some company under the Act has established a line in lieu of or competing with it; and the second authorizes the Governor in Council to grant Canadian charters to English telegraph companies if they do not possess any exclusive privilege of landing cables in any other State or country. The bill is in substance the same as that of last year, which was reserved by the Governor-General for the signification of her Majesty's pleasure, and which Lord Canarvon, upon the opposition of my company, decided to leave in abeyance in order that the Dominion Parliament might have the opportunity of reconsidering its provisions. The bill is promoted at the instance of the Direct United States Cable Company, with the view of compelling the Anglo-American Company, who hold the exclusive right of landing cables in Newfoundland, to give up that right and to allow their competitor to land in the island. The Anglo-American Company, by virtue of its amalgamation in 1873 with the Newfoundland Telegraph Company, became the owners of six telegraph cables between Newfoundland and Cape Breton, some of which were laid nearly twenty years ago, and which have been worked ever since, either for the transmission of local messages or for the traffic between Europe and America. Previous to the first cable being laid to Cape Breton, the Newfoundland Company made an agreement with the Nova Scotia Telegraph Company, who held the sole legislative right of making telegraph lines in the province, by which the Newfoundland Company were permitted in the name and under the authority of the Nova Scotia Company to land its cable on Cape Breton, and to make the needful land lines to join the existing wires to the mainland. The subsequent cables were laid under like arrangements, and have continued to be worked without question or hindrance to the present time. As may be supposed, there was no law against the landing of telegraph cables on the wild and stormy shores of Cape Breton (except the act of the Nova Scotia Telegraph Co.); and the Newfoundland Co., in perfect good faith, expended some hundreds of thousands of pounds, and laid their lines to the great advantage of all the provinces, and, I think I may add, to the benefit of the world at large. The Dominion Government have deliberately proposed to confiscate the use of these cables without compensation, so soon as the opposition company has succeeded in completing its line. Surely there never was so unjust or so unreasonable a measure! My company

and its partners were the pioneers of Atlantic telegraphy. They labored for many years at an enterprise which most people deemed Quixotic; they have spent in hard cash about five millions sterling upon the faith of their transatlantic connections; they have received but a very moderate return upon their outlay; their exclusive rights were made redeemable upon purchase of the local lines; they have brought their system and arrangements to such perfection as to transmit 4,000,000 words a year at an average speed between London and New York of 18 minutes per message, and have reduced the tariff from £20 per message of 10 words to 4s. for a single word; and at the first appearance of a competing company, whose capital was subscribed for a line 'direct to New York,' and who might have landed at St. Pierre or Halifax, or any other place near Newfoundland, but who have as yet failed to establish any line, direct or indirect, the Canadian Government exhibit their appreciation of our past efforts and services in the manner I have above described. The foundation of the bill is, of course, the desire to establish competition and obtain lower rates. To this I do not object, provided the war be carried on fairly; but I submit that no Government can, with any regard to equity, deprive the citizens of another and friendly State of their rights and property under such circumstances as exist in the present case. The bill now before the Canadian Senate is unprecedented for its injustice, and if passed and put in force in its present form cannot fail to weaken confidence in all Colonial Legislatures, and to create a storm of indignation and anger which will tell with weighty effect upon Canadian enterprises seeking capital in England. I should add that a clause has been added to the bill since its introduction which seems to me to put the matter in a worse light than before, because, while it pretends to be a compensation clause it is simply a delusion and a snare. I fully admit the right of the Canadian Government to legislate as to the terms on which foreign companies may land upon its shores, but such legislation ought to be for future cables only, and not, as in the recent case, be retrospective and aimed at the confiscation of rights created by the laws of a neighboring province passed twenty years ago, and upon the faith of which millions have been invested. If the Government insist upon their bill, and the Company have to remove their six cables from the Dominion, they will inflict a great loss and injury upon our stockholders; but how will they benefit themselves, and what will be the position of our Canadian brethren in case of war if our American cousins hold the keys of all, or all but one, of the telegraphic lines to and from England? I am your obedient servant,

"H. WEAVER, General Manager."

## THE MONUMENT TO GALVANI.

The *Fanfulla*, speaking of the meeting held for erecting at Bologna a monument for the illustrious physicist, L. Galvani, says that the designs given in were twenty-three in number, the jury deciding in favor of the young Roman sculptor, Cencetti. The artist has selected the culminating point of the scientific life of Galvani, in which the immortal Bolognese is attentively watching the electric phenomena manifested in the movements of the frog. The expression of the face and of the whole body reveal the anxiety of the man of science and the emotion produced by a great discovery.

THE Secretary of the Direct Spanish Telegraph Company announces that the communication with Spain *via* Santander is restored, and that the cable is again open to public traffic.



**ELECTRIC DISCHARGE IN THE AURORA BOREALIS, AND THE SPECTRUM OF THE SAME PHENOMENON.**—*M. Selim Menstrom.*—The pale lights seen over the summits of the mountains of Spitzbergen and Lapland are of the same nature as the aurora. Similar phenomena observed in other regions prove that electric discharges of the same nature as the aurora may occur elsewhere besides in the Arctic regions. The spectroscope is the safest means of determining the nature of these phenomena in doubtful cases. In the spectrum of the aurora there are nine rays, which probably agree with the lines given by the component gases of the atmosphere. The spectrum of the aurora may be resolved into three different types.

**WANTED**—By a young man who has had several years experience with Railroad Business, Train Orders, W. U. Business, &c., a lucrative situation. Best of references furnished. Address, until April 15th, OPERATOR, P. O. Box 683, Newburyport, Mass.

**WANTED**—BY YOUNG MAN, FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 140, Janesville, Wis.

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Orders filled by

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THE WESTERN ELECTRIC MANUF'G CO.,  
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### LECLANCHE BATTERIES.

#### IMPORTANT NOTICE.

After January 1st, 1875, we will allow 20 Cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

THE LECLANCHE BATTERY CO.,  
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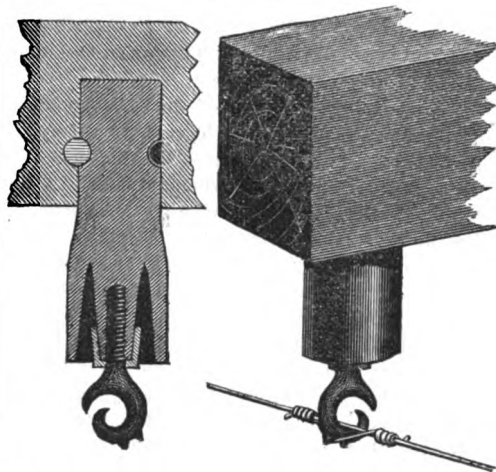
Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
8 Dey St.  
PHILADELPHIA: 54 South Fourth Street  
CINCINNATI: 22 West Fourth Street.



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#### TELEGRAPH COMPANIES and TELEGRAPH CONSTRUCTORS

are invited to examine the merits of our new and improved patterns of



#### KENOSHA CARBON INSULATORS!

These insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellent of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of SIX YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average,

MORE THAN TEN TIMES AS GREAT

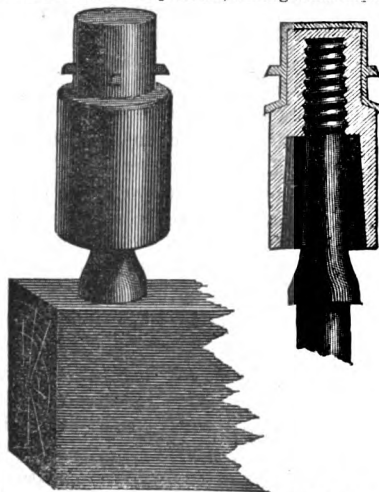
during the prevalence of rain or fog.

Immense numbers of these insulators are in use by

The North Western Telegraph Co.,  
The Western Union Telegraph Co.,  
as well as many RAILWAY and OTHER TELEGRAPH LINES,  
and they have invariably been found to give

#### ENTIRE SATISFACTION.

Besides the suspension insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, and which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



#### CAP INSULATOR, WITH PIN OR BRACKET,

which is fitted with a zinc protection, as shown in the above figure.

THE KENOSHA INSULATOR is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice, CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all insulators furnished by us to prove entirely satisfactory.

THE KENOSHA INSULATOR CO.,  
KENOSHA, WIS.

L. G. TILLOTSON & CO.,  
8 Dey Street, New York,  
GENERAL EASTERN AGENTS,

### THE AMATEUR'S Telegraph Apparatus.

With this Instrument is furnished

A Complete Outfit for the Student,  
INCLUDING  
BATTERY,  
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There are several thousand in use.

#### PRICES.

Complete Outfit .....	\$7 50
Sounder and Key .....	8 50
" " with Cut-Out and Lightning Arrestor .....	8 00
No. 2 Complete .....	5 50
" " Instrument only .....	4 50

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### ORTON'S PATENT PENCIL HOLDER.

This Holder is intended to save the last half or third of the pencil.

#### DIRECTIONS.

When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price

Price per dozen, - - 50 cts.

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As manufacturers of all the perfect TELEGRAPHIC PRINTING INSTRUMENTS in use, and owners of a large number of Patents, we are prepared, under the facilities of our contracts with the WESTERN UNION TELEGRAPH CO. to extend our system of COMMERCIAL REPORTS and PRIVATE LINES to all parts of the UNITED STATES.

General Offices, No. 61 Broadway, New York.

MARSHALL LEFFERTS, Pres't.  
GEORGE B. PRESCOTT, Vice-Pres't.  
HENRY H. WARD, Sec. and Treas.  
GEORGE B. SCOTT, Sup't.

WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, March 10, 1873.

### DIVIDEND No. 32.

THE BOARD OF DIRECTORS have declared a Quarterly Dividend of **TWO PER CENT.** on the Capital Stock of this Company, from the net earnings of the three months ending March 31st instant, payable at the office of the Treasurer, on and after the 15th day of April next, to shareholders of record on the 30th day of March.

The transfer books will be closed at three o'clock on the afternoon of the 30th instant, and opened on the morning of the 16th of April.

R. H. ROCHESTER,  
Treasurer.

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INSTRUMENTS,

The Most Reliable and Fastest Printing Instruments for Private Lines made.

No Acid or Galvanic Batteries Used!!!

Will PAY for themselves

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Our instruments are used by the Cities of Boston, Cambridge and Fall River, Mass., for their Police Telegraphs; by the Cunard Steamship Co., Boston and Albany R. R. Co., Charles L. Lovering, Esq., Taunton, Mass.; Thomas J. Borden, Esq., Fall River; and numerous other Manufacturers, Merchants, &c., &c.

If you want to purchase THE BEST Private Line Instruments, or can sell such, send for illustrated circulars and terms.

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We are offering our TELEGRAPH INSTRUMENTS at 20 per cent. Discount from our list, or from the present published price list of any other manufacturer of first-class Telegraph Instruments. Quality will be strictly maintained.

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AND

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San Francisco, Cal. Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central office, or upon the

### AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM reliability:

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Buffalo, N. Y.,  
Baltimore, Md.,  
Chicago, Ill.,  
Cincinnati, Ohio,  
Columbus, Ohio,  
Cambridge, Mass.,  
Charlestown, Mass.,  
Covington, Ky.,  
Detroit, Mich.,  
Dayton, Ohio,  
Elizabeth, N. J.,  
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Jersey City, N. J.,  
Louisville, Ky.,  
Lawrence, Mass.,  
Mobile, Ala.,  
Montreal, Canada,  
Milwaukee, Wis.,  
New York City,  
Lynn, Mass.,  
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New Orleans, La.,  
New Haven, Conn.,  
Newark, N. J.,  
Omaha, Neb.,  
Philadelphia, Pa.,  
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Portland, Me.,  
Peoria, Ill.,  
Providence, R. I.,  
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Rochester, N. Y.,  
Richmond, Va.,  
Indianapolis, Ind.,  
St. Louis, Mo.,  
St. John, N. B.,  
Springfield, Mass.,  
San Francisco, Cal.,  
Savannah, Ga.,  
Syracuse, N. Y.,  
Troy, N. Y.,  
Toledo, Ohio,  
Toronto, Canada,  
Washington, D. C.,  
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New Bedford, Mass.,  
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The distinctive features of these systems of  
FIRE ALARM AND POLICE TELEGRAPHS,

ARE,

First—The AUTOMATIC SIGNAL BOXES, the simple electro mechanism of which enables any one—even a child—to give an instantaneous, general, and definite alarm of fire.

Second—The AUTOMATIC REPEATERS, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked without the constant personal attention of either operators or watchmen.

Third—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

Fourth—The ELECTRO-MECHANICAL GONG STRIKERS, for house and engine houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

These features combined form the

ONLY PERFECT, COMPLETE, AND RELIABLE SYSTEM

OF

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Messrs. GAMWELL & CO. are the owners of the original, FARMER and CHANNING PATENTS, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or effort to secure improvements, and the systems are now covered by

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The introduction and operation of the

AUTOMATIC SYSTEM

involves no little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

The co-operation of TELEGRAPHERS in securing into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

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Weekly Mail Steamship service between  
PHILADELPHIA AND LIVERPOOL,

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Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.

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Appointed to carry the Belgian and United States Mails.

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From Philadelphia.	From New York.
VADERLAND, NEDELAND,	SWITZERLAND, State of Nevada,
April 3, April 27,	Mar. 22, April 15.

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For Philadelphia.	For New York.
VADERLAND, NEDELAND,	SWITZERLAND, State of Nevada,
Feb. 10, April 3,	Feb. 26, March 22.

PRICES OF PASSAGE IN CURRENCY.

First Cabin, \$90. Second Cabin, \$60.

Steage tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed.

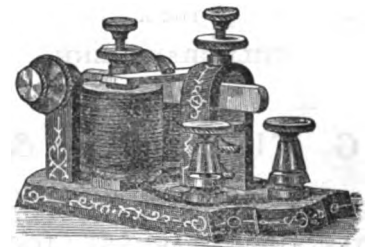
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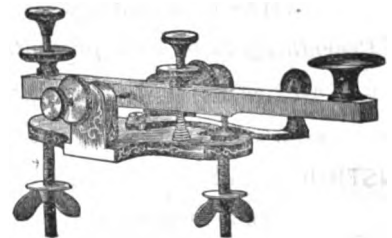
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PHIL. SHERIDAN, \$4.50.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether it is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. extra.



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You can see at once that the above cut represents a first class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, &c., &c. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines, and—LOOK AT THE PRICE—I will sell Sheridan Sounder and Key together for..... \$7.00

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Rolays, beautiful design and finish..... \$15 to 17.00

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Batteries and Supplies of all kinds at the lowest prices. Send for Price List and Catalogue. Special Prices on large orders sent by mail. Address,

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They have the **GREATEST VARIETY.**

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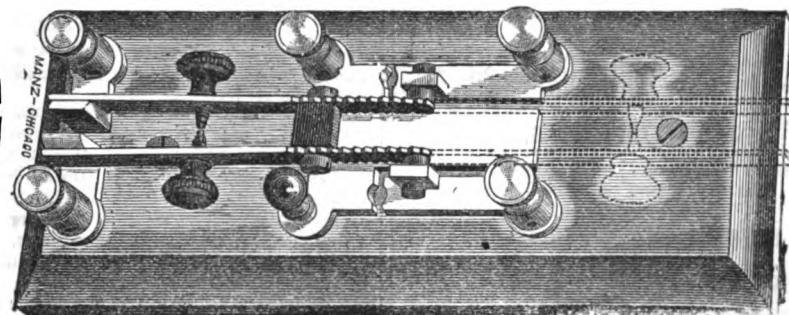
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Our Morse Instruments are of the Western Union, Ottawa (or Caton) style.  
We have ample facilities for the execution of every variety of electrical work.

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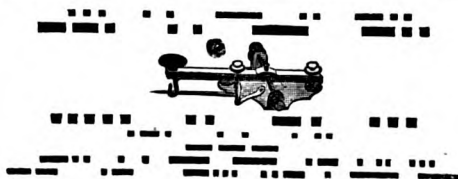
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Polished, 30c., or 6 for \$1.50.

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Polished, with knob and screw fastenings, 75c.

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The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

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Price per dozen \$3.00.

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Of the size and thread used by the Western Union Telegraph Company

Having secured an Exclusive Agency for these Insulators, (manufactured under the Cauvet patent,) we are filling orders promptly for large or small quantities, at prices as low as any insulator can be sold for in the market.

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**SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS,  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
SWITCHES, GALVANOMETERS,  
RESISTANCE COILS.**

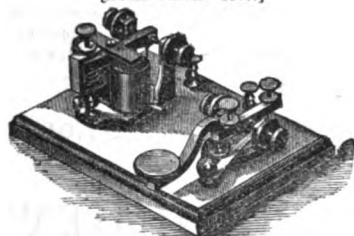
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Special attention given to repairing Scientific Instruments.  
Several of our workmen having served their time in the most  
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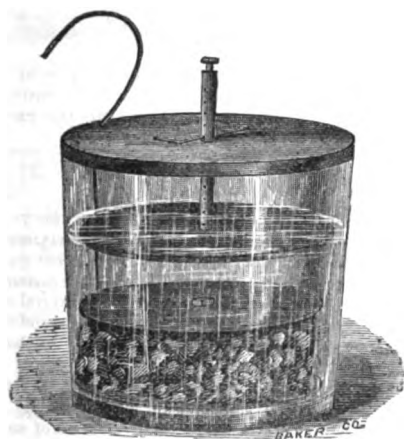
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## BLISS' RESERVOIR BATTERY.



**Price per Cell, \$2.**

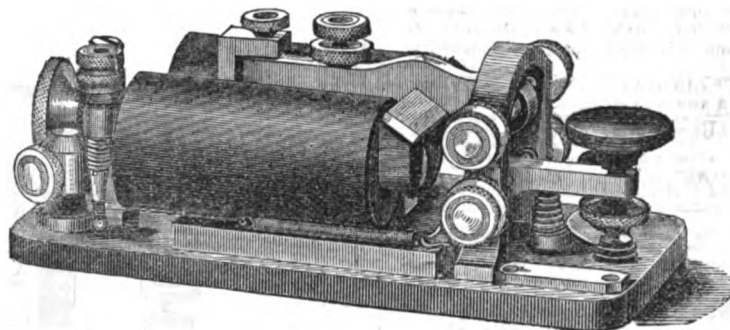
It will run as a local battery for six months without atten-  
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[BUNNELL'S LITTLE GIANT POCKET RELAY.]

In the form of Pocket Relays as shown above, or WRECKING SETS, larger size, same style, or for use on Main Line in  
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They are very compact, but the working parts are all of full size.  
They give out a very clear, distinct stroke, nearly as loud as that of a good Local Sounder.  
The adjustments are peculiarly convenient. All parts are perfectly made, highly finished, and mounted upon *Polished Hard  
Rubber Bases*.  
As this form is so entirely new, and so far superior to any others hitherto made, it should be seen by all Superintendents, and  
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**EVERY RAILWAY TELEGRAPH LINE,**

with a view to its adoption as the

**STANDARD INSTRUMENT FOR WRECKING SETS AND OFFICE PURPOSES.**

[Messrs. L. G. Tillotson & Co. are the only parties authorized by me to manufacture these instruments.]

JESSE H. BUNNELL.]

<b>PRICES—Pocket Relay in case.....</b>	<b>\$22 00</b>
<b>Larger Size, for Office or Wrecking Uses, on Hard Rubber Base, with Key on Base, .....</b>	<b>24 00</b>
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Subject to our 20 per cent. discount on all orders accompanied by cash or money order.

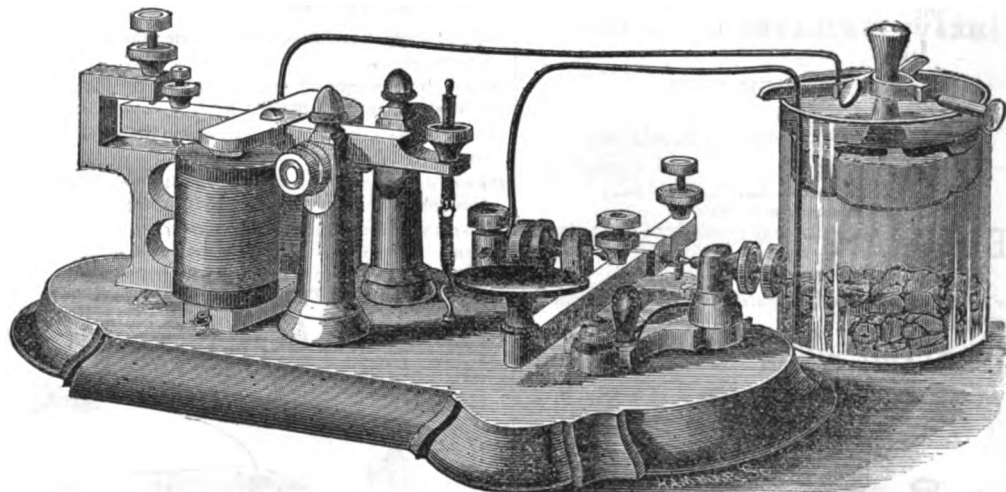
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## BUNNELL'S CHAMPION LEARNER'S INSTRUMENTS.



**Complete and Perfect Full-Sized Sounder and Key combined, with Book of Instruction  
Battery, Wire, and all necessary materials.**

[Since my invention and introduction of these instruments, less than a year and a half since, two thousand sets have been  
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THESE SETS ARE MADE IN THE BEST MANNER, and are just exactly the thing wanted for Learners' uses, for  
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<b>Price, complete, with Battery, Book of Instructions, Wire, and all necessary material to put in operation.</b>	<b>\$8.50</b>
<b>Singly, or on a Short Line.....</b>	<b>6.50</b>
<b>Champion Learner's Instrument, without Battery, &amp;c.....</b>	<b>7.50</b>
<b>Ornamental " with Rubber-covered Coils, &amp;c.....</b>	<b>7.50</b>

Same instruments, wound with fine Silk-covered Wire, so as to work well on lines up to twelve miles in length, \$1.00 in  
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These prices are subject to our usual discount of 20 per cent. where money is sent in advance, either by postal order  
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**DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.**



# A SUPERIOR PRINTING TELEGRAPH INSTRUMENT, FOR PRIVATE AND SHORT LINES,

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. E. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is SIMPLE, RELIABLE, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

**PRIVATE LINES** constructed in the best and most substantial manner, and on reasonable terms.

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Wires of every variety of Insulation

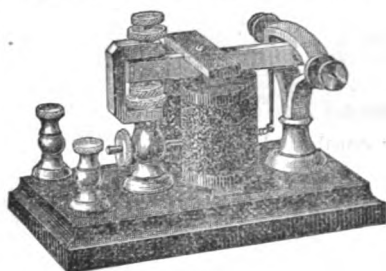
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Manufacturer and Dealer in

## TELEGRAPH INSTRUMENTS.

341 Newark Avenue, Jersey City, N. J.

Now offers for sale, or will manufacture to order all kinds of Telegraph Material.

## NEW STYLE SOUNDER—"STENTOR."



Price \$5.00.

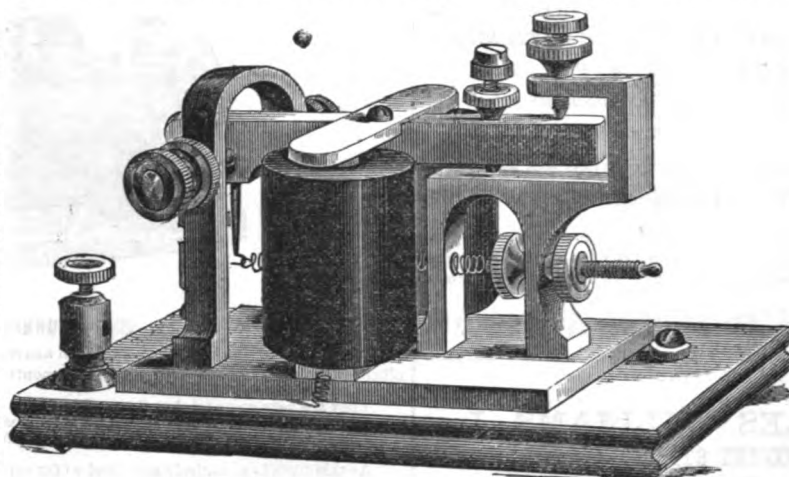
**COPPER  
OFFICE AND MAGNET WIRE,  
BRAIDED AND WOUND,  
SINGLE and DOUBLE, with COTTON,  
LINEN, SILK;**

Paraffined or Varnished, Compressed and Polished.  
Manufactured and for Sale by

**WESTERN ELECTRIC MANUFACTURING CO.,**  
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# PARTRICK & CARTER'S Giant Sounder Perfected.

**OFFICE & MAGNET WIRE,**  
BRAIDED AND WOUND, SINGLE and DOUBLE,  
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Paraffined or Varnished, Compressed and Polished.



MANUFACTURERS OF  
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The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. **Every Instrument Warranted Perfect.**

**PRICE \$7.50.**

Sent C. O. D. by Express. On Receipt of Money Order, \$7.00.

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THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.; or \$8.00 if Money Order for the amount sent in advance.

The latter plan will additionally save the purchaser the Express charges for returning money.

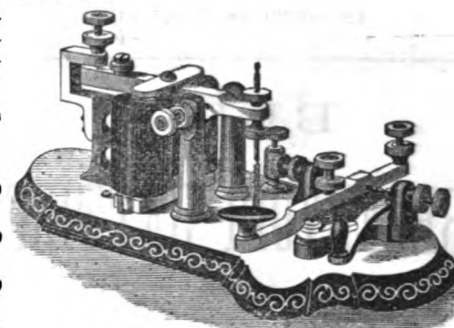
Price of single instrument, good for one mile or less, without Battery, &c. \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7 50

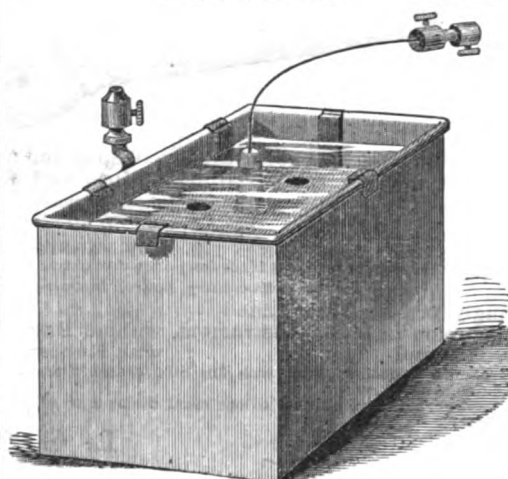
Price of single instrument, good for one to twelve miles, without Battery, &c. 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8 50

THIS IS WARRANTED TO BE, BEYOND ALL COMPARISON THE BEST APPARATUS ever offered for the use of STUDENTS OF TELEGRAPHY. Being excellent Morse Instruments, substantially made and nicely finished, with nothing left out of their construction which pertains to a complete sounder and key combination set; NOTHING MADE IN MINIATURE OR IN AWKWARD AND UNUSUAL SHAPE, as is done with the very cheap affairs usually offered as learners' apparatus. They are equally well suited for



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THE EAGLES METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the **best and most powerful of all constant batteries**, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

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When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and **ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.**

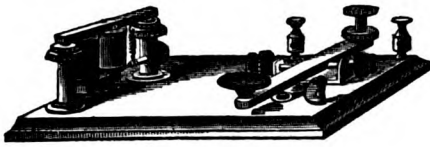
For OPEN CIRCUITS, where all other gravity batteries are acknowledged FAILURES, the Eagles Battery is found to be, in every respect, A PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - \$2.25  
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## SPECIAL NOTICE.

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**"THE BEST IS ALWAYS CHEAPEST"**

as demonstrated by the unprecedented demand which has arisen for our

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For STUDENTS and AMATEURS.

The custom introduced by us of making Agents of Managers and Operators, and sharing the profits from the sales of these instruments with them, has also assisted in increasing our sales to such an extent that we have been compelled to enlarge our facilities for their manufacture.

We are now prepared to furnish these unrivalled Amateur Instruments, with or without Office Outfits, in any quantity, and at a moment's notice. Our Agents may now send in their orders as rapidly as they please, and can rely upon their being promptly executed.

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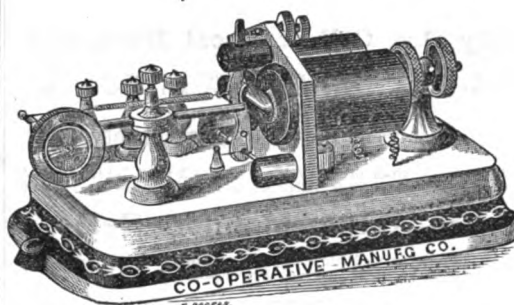
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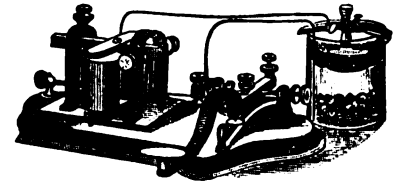
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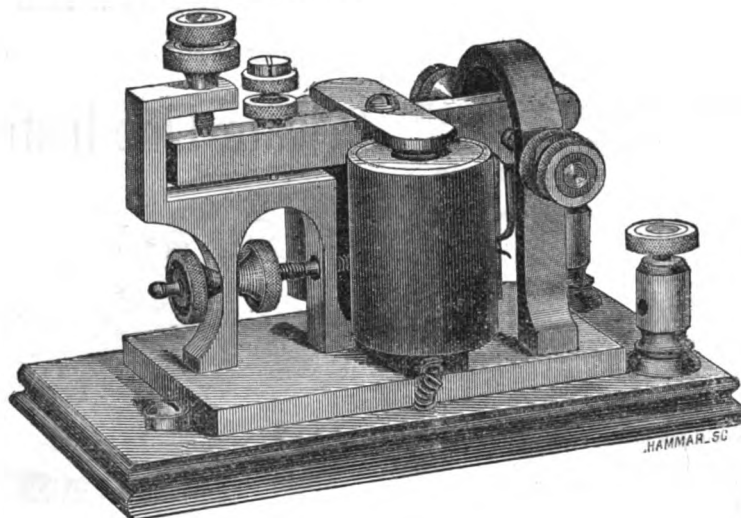
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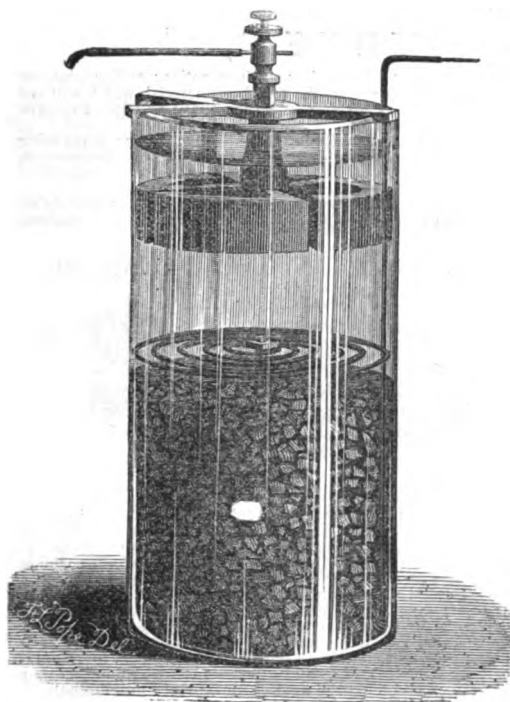
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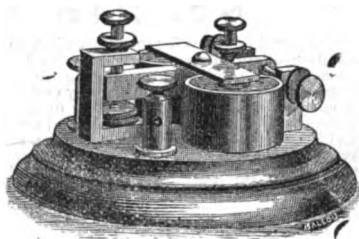
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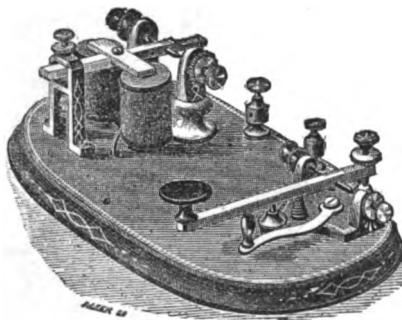
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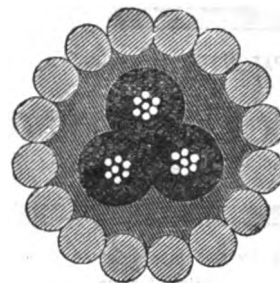
This Instrument is well finished, and gives a clear, loud sound. It is made to work on a line from a few feet to ten miles long. In ordering, give length of line, size of wire, and number and kind of Instruments in the same circuit.

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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 8.

NEW YORK, APRIL 15, 1875.

WHOLE NO. 179.

## THE PNEUMATIC DESPATCH SYSTEM IN THE WESTERN UNION TELEGRAPH BUILDING, NEW YORK.

[From the Scientific American.]

We have recently examined, with considerable interest, the pneumatic system of transmitting telegraphic messages between the operating and receiving rooms in the newly constructed building of the Western Union Telegraph Company, in this city. In such an immense edifice, comprising eleven stories, it would obviously involve great delay to maintain the necessary communication by means of messenger boys, and consequently the apparatus which we describe and illustrate has been introduced, with remarkably successful results. In the large engraving, Fig. 1, sections of several of the stories are represented, showing the manner of leading the numerous tubes through which the necessary current of air, which propels the packages, is maintained.

Those of our readers who have had occasion to send a telegram at the central office above named may remember that, after they had delivered the writing to the clerk, that functionary rolled the paper in a little parcel and inserted it in a wood and leather case, of the manner and form shown in the upper portion of the illustration, Fig. 1. He then dropped the case into an open tube, leading up through his desk, at A, and perhaps announced that the packet had reached the operating room, in the seventh story, almost

before the curious watcher of his proceedings had had time to draw a second breath. The packet appeared to be sucked into the tube, and so in fact it is, and in about two seconds it is drawn up almost to the top of the great building. After leaving the

clerk's hand it passes down through the wide curve in its conduit, at B, and thence ascends the straight portion of the same, until it jumps forth from the end of the tube in one of the compartments of the receptacle, C, in the operating room. A section of

a portion of this receptacle is shown in Fig. 2, in one compartment of which a packet is seen emerging from its tube. The compartments C, Fig. 2, are entirely cut off from the main portion of the case, being constructed within the same, so that above them and extending over all is a large empty chamber, E. With the latter, however, each compartment communicates by an orifice, F, which is provided with a cover opened or closed at pleasure, thus, as will be seen further on, throwing any tube into or out of action, or moderating the air current therein. In the centre of the receptacle and opening into the upper chamber, E, is a large tube, D, which, as shown in Fig. 1, extends down beside the pipes B, and connects with a blower in the cellar. Regarding this blower we have, on other occasions, had considerable to say, but a word with reference to it here may not be amiss. It is a positive blast rotary blower, invented and constructed by the well known firm of P. H. & F. M. Roots, of Connersville, Ind., represented in this city by Mr. S. S. Townsend, general agent, No. 31 Liberty street. The machine has long been in use in iron foundries, machine and blacksmith shops, pork-packing and other

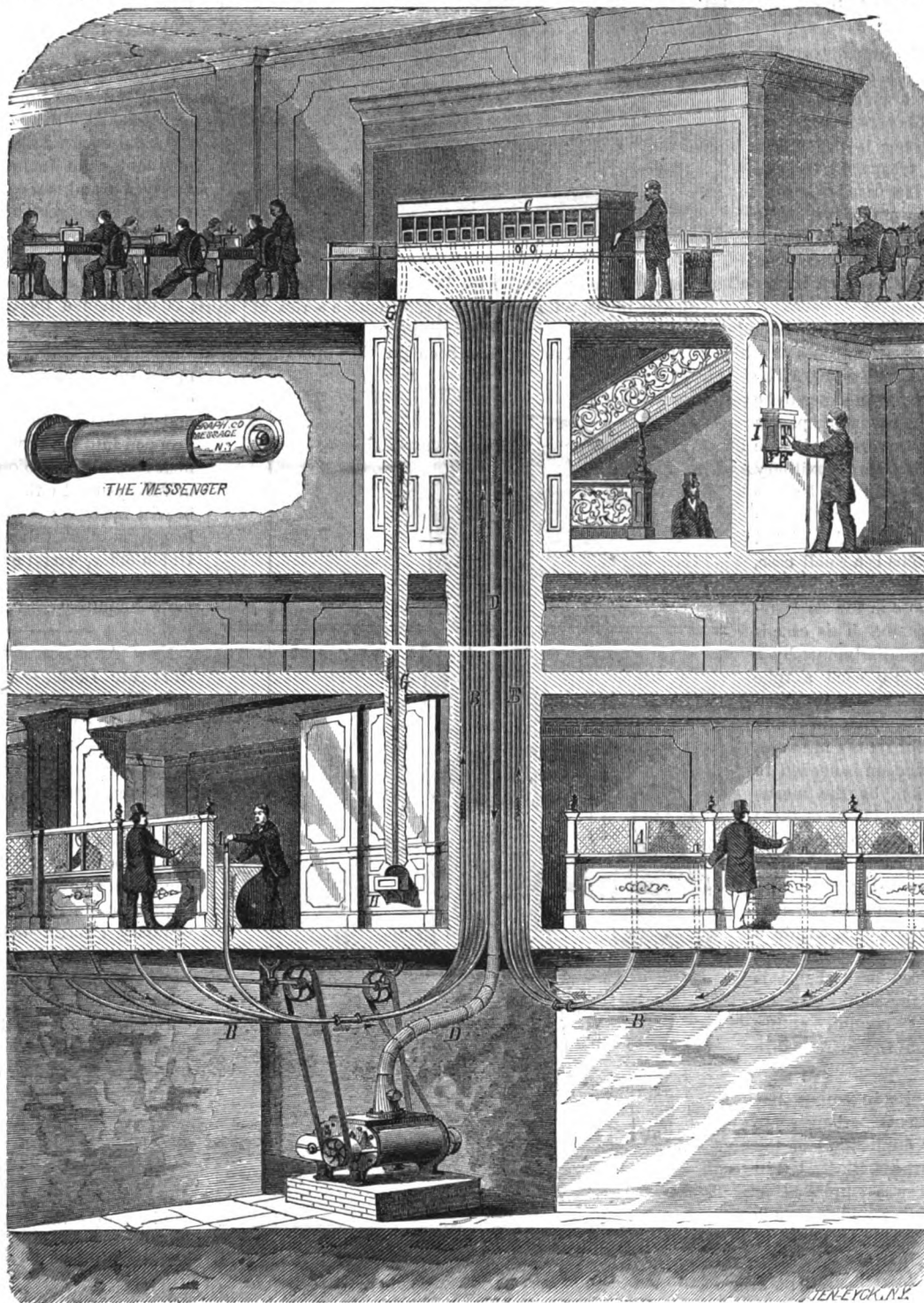


Fig. 1.—ROOT'S BLOWER, APPLIED TO THE PNEUMATIC DESPATCH.



establishments, and, besides, has met with extensive employment for ventilating purposes in buildings, ships, mines, and other localities. It will be understood that, in the present instance, the blower forces the air out beneath, so that the current is drawn down the tube; D, through the chamber, E, in the receptacle above, thence through the orifices, F, and compartments, C, and finally up through the pipes, B. Thus used as an exhaust, and at the slow speed of 120 revolutions per minute, it draws down five cubic feet of air per revolution, or 36,000 cubic feet per hour, thus propelling the packets, and at the same time (by removing the last mentioned aggregate quantity of air from the atmospheres of the rooms with which the pipe orifices communicate) serving as an excellent and efficient ventilating apparatus.

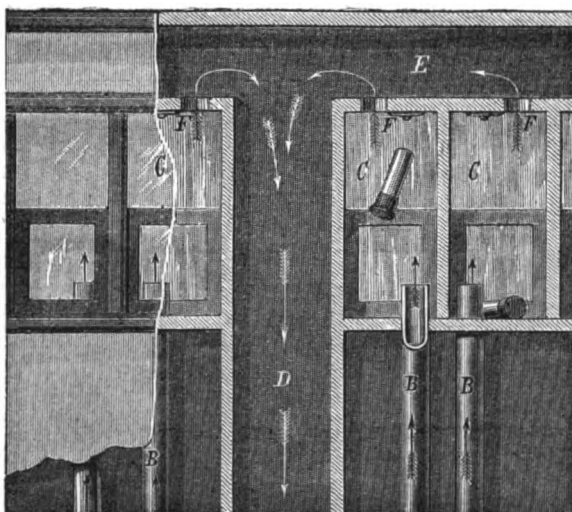
After a packet arrives in the upper story, the person stationed at the receptacle lifts a little window in the compartment which it enters, takes out the case, extracts the paper therefrom, and passes the message at once to the proper operator, who immediately telegraphs its contents to their destination. The case is then returned to the first story by dropping it into the open tubes, G, through which it falls by its gravity, landing in the box, H, whence it is again taken out to be filled and started back on its journey.

Of course there is a large number of the conduit pipes, B, as one opens before every desk at which telegrams to be despatched are received. The whole system, however, is so arranged as to be readily accessible, through movable panels placed in the walls at points traversed. Beside the general set of pipes there are auxiliary circuits, in some of which lateral tubes lead to the offices of the President, the General Superintendent, the Treasurer, and the Associated Press. In each of these rooms is a small case, I, provided with glass windows to be raised for interior access, similar to those in the large receptacle in the operating room. This case is divided vertically into two compartments by a wire gauze partition, and into each a tube enters, one tube leading to one of the compartments in the main receptacle above, the other being merely a drop pipe for return messages or empty cases. No explanation is needed to show that a constant suction, by the means already described, is maintained in one of these tubes, so that the officer wishing to forward a message has only to insert the packet, which travels, as before, to the operating room, and the answer to his question, from a station perhaps on the other side of the world, within a few minutes drops back in the opposite compartment. It will be noticed here that this return is accelerated along the lateral pipe by the exhaust from the first conduit acting through the former, through the wire gauze partition in the box.

The entire apparatus is quite ingenious, and for such extended use presents perhaps some advantages over the older application of the Root blower to the same purpose, illustrated in Fig. 8. This arrangement was employed in the old Western Union building, and as seen is operated by hand. The principal point of difference lies in the fact that in this case the packets are driven up by a blast instead of drawn up by suction. The cases are inserted in the receptacle shown near the hand wheel, and thence are

blown upward until they strike a curved guide, which causes them to enter a box placed for their reception. In returning, they simply fall through the tube and slide into a suitable receptacle. This

Fig. 2.



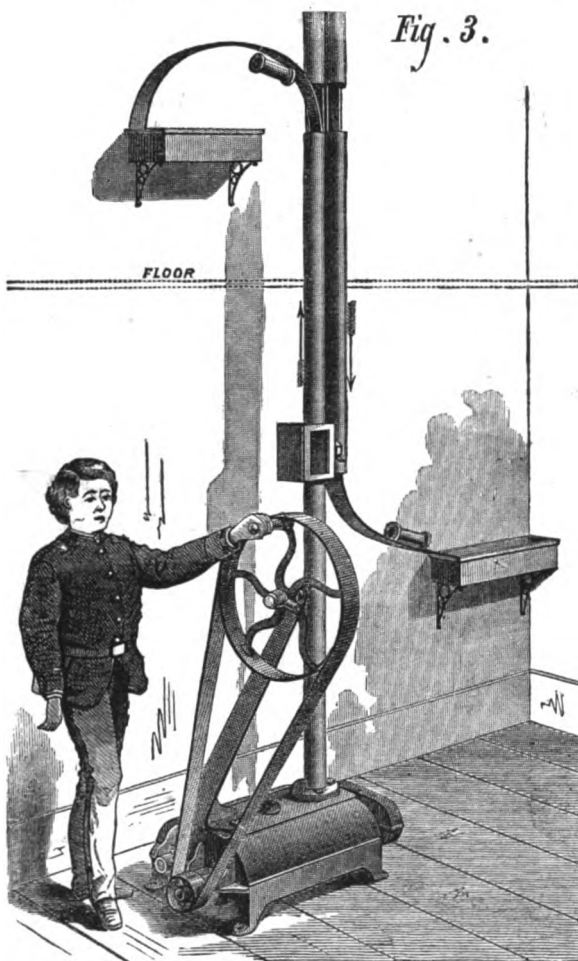
plan may be operated with horizontal and perpendicular pipes, with a single pipe, or with a series of tubes leading throughout a building.

The method which has been put in operation

of the Broadway Underground Railway Company, corner of Broadway and Warren street, in 1870-1, and has heretofore been described in our columns. In that example a Root blower was employed in the

same manner as here illustrated in Fig. 1, to exhaust the air from a general receiving box, with which the pneumatic transmitting tubes communicated. The latter curved about in various directions through the premises; and when letters or parcels of any sort were dropped into the tube, they were instantly carried forward into the receiving box. The latter was so arranged as to permit the removal of the contents at will. The successful operation of this method attracted much attention. Even the smallest bits of thin paper, pennies, envelopes, handkerchiefs of visitors, newspapers, and packages of considerable weight were unerringly transmitted and delivered. The highest velocity of transmission was between 40 and 50 miles per hour, the pipes being six and eight inches in diameter. This general design of postal transmission consists in having tubes of about eight inches in diameter, laid under the streets and made to communicate with the various lamp post letter boxes. These pipes radiate, in lengths of a half mile, in various directions from a postal station, where they communicate with receiving boxes in which an exhaust is maintained by Root blowers, as shown in our engraving. Thus, whenever letters are dropped in at the lamp posts, they fall at once into the pneumatic tube and are instantly carried forward, on the wings of the wind, to the nearest station, and thence delivered, or by the attendant dropped into the tube that leads onward to the next station, and so on. The general adoption of this system by the post office, allowing that it will operate through tubes of half a mile length as effectively as it does at the Western Union office, would expedite the collection and delivery of city postal matter, and greatly promote the public convenience.

Fig. 3.



in the Western Union Telegraph building is similar to the design of Mr. A. E. Beach, of the *Scientific American*, for pneumatic postal transmission, which was first put in practical operation on the premises

**NEW ARRANGEMENT FOR PRODUCING THE ELECTRIC LIGHT.**—*M. Wilde.*—A Mr. Ladyguine has overcome all the difficulties encountered in the production of the electric light, and has rendered its general use practicable. It has long been known that the carbon electric light is not due to a direct luminous effect of the electric current, but merely to the property which this current possesses of heating the conductors which it traverses, and that with the greater intensity the more resistance they oppose to its passage. The intensity of the ordinary electric light (with carbon points) arises from the circumstance that the stratum of air, a bad conductor, which is found between the two charcoal points, is heated to an excessive degree by the passage of the electric current, and thus produces indirectly the combustion of the coke or charcoal electrodes, heated to whiteness. It has also been long known that solid bodies may also be heated to whiteness without the presence of gaseous matter. Thus, slender platinum wires have often been heated by the current. The light from this source is more fixed and constant than that of the luminous arc between the carbon points; but it is too feeble and too costly, whilst attempts to increase its intensity generally result in the fusion of the platinum. M. Ladyguine replaces the wire by slender rods of carbon (coke) hermetically sealed in a glass receiver, from which the oxygen has been removed.

## SOCIETY OF TELEGRAPH ENGINEERS.

INAUGURAL ADDRESS, BY MR. LATIMER CLARK,  
PRESIDENT, JANUARY 18, 1875.

(Continued from page 83.)

Reverting to the progress of the telegraph in England, we find Mr. Cooke in 1837 in negotiation with the directors of the London and Birmingham Railway for laying down a telegraph from London to Birmingham, a project which did not, however, arrive at completion. In the following year (1838) Mr. Cooke conducted some extensive experiments at St. Katharine's Docks, in which he exhibited the telegraph in operation through 110 miles of No. 16 covered copper wire. Mr. Brunel at this period took up the matter, and a line of pipes with five wires was laid down on the Great Western Railway from Paddington to Drayton, which was afterwards extended to Slough in 1841. The total cost of this line to Drayton was £3,270 6s. The insulation becoming defective, the pipes were removed and sold, and poles and iron wires were erected in their place in 1841, the wire being in the first instance temporarily insulated on quills. In 1840 Mr. Geo. Stephenson adopted it on the Blackwall Railway, which was then worked by a stationary engine and rope. In 1841 Sir Charles Fox ordered a telegraph on the Cowlairs and Glasgow Line. It was then fixed on one of the Midland tunnels, and on the Dublin and Dalkey Atmospheric Railway.

In 1842 Mr. Cooke was in negotiation with the Admiralty in reference to a line from London to Portsmouth; he also published a book termed "Telegraphic Railways on the Single Way." In this year plans for the Norwich and Yarmouth Line were approved by Mr. George Hudson. In 1843 the telegraph was ordered for the Dalkey and Kingstown Atmospheric Railway by Mr. Samuda, and on this line galvanized iron wire was first employed. The Norwich and Yarmouth Railway, a single line, was opened in May 1844; the Northampton and Peterborough Line and the Croydon Line were completed in 1845. These were followed by the Southwestern Line from London to Gosport, and the Southeastern Line, the first portion executed being the Maidstone Branch.

It appears that the funds necessary for the management of the partnership were provided by Mr. Cooke, and the results were at first by no means encouraging. His account books, which were produced in evidence during an arbitration which took place in 1841, before Marc Isambard Brunel and Professor Daniell, showed that, prior to his connection with Professor Wheatstone in February 1837, he had expended £385 8s. 10d. on his experiments; by the end of 1843 this deficit had increased to £6,232 16s. 1d.

The celebrated message which led to the capture of John Tawell, a Quaker, who had committed a murder at Slough, was sent on the 1st January, 1845, and it had a powerful influence in arousing public attention to the value and capabilities of the telegraph.

In erecting the Blackwall Railway Mr. Cooke made the acquaintance of Mr. George Stephenson and Mr. George Bidder, and in 1842 Messrs. Cooke and Wheatstone inserted a series of advertisements in the *Railway Times* and other papers, drawing attention to the merits of their invention. These circumstances eventually led to Mr. Cooke's introduction by Mr. Bidder to Mr. John Lewis Ricardo, M. P., afterwards for many years Chairman of the Electric Telegraph Company, a gentleman by whose energy and enterprise the Company was created and

led to a high pitch of prosperity. The first interview took place on the 1st of October, 1845, and so prompt and decisive was their action that on the 17th of that month Mr. Ricardo and Mr. Bidder wrote a joint letter to Mr. Cooke, accepting the terms he had proposed.

The Company was registered on the 2d of September, 1845, and a provisional prospectus was issued shortly afterwards.

The first directors were Mr. J. L. Ricardo, Mr. Samson Ricardo, Mr. W. F. Cooke, Mr. George Bidder, and Mr. Richard Till. An Act of Parliament was obtained on the 18th June, 1846, and they commenced business, in an imperfect manner, at their first offices at 845, Strand, where they educated their clerks, the system employed being the Cooke and Wheatstone double-needle instrument.

The capital of the Company was privately subscribed by the directors above named, and it would appear that under the arrangements made with the patentees they received about £160,000 for their patents in money or value. This purchase included Mr. Cooke's half share of the London and Portsmouth Telegraph and the telegraph to Slough. Out of this amount Professor Wheatstone received £30,000 in cash and £3,000 for royalties then due, and Mr. Cooke received the remainder. I believe, however, that Mr. Cooke's personal share amounted practically to about £96,000, of which the greater portion was in shares, many of which were subsequently disposed of at a loss.

During 1847 the Electric Telegraph Company erected their central station at the end of Founder's Court, Lothbury, the funds for this handsome building having been provided by Sir Samuel Morton Peto. It was formally opened on the 1st January, 1848, and at this period 1,514 miles of telegraph were either erected or in progress.

The business was not an uninterrupted success. The first day they took about £20, but this amount steadily increased each day.

The large hall was filled up with instruments from top to bottom, each gallery being appropriated to a different division of the country, and having a staff of clerks ready to receive and transmit messages. I believe at that time the cost of a twenty-word message from London to Glasgow or Edinburgh was about 17s. 6d.; to Yarmouth 9s. 6d.; to Ipswich 5s. 6d.; and to Southampton 8s.

It was soon found that they had overrated the immediate capabilities of the telegraph traffic; they had spent all their capital and their expenditures greatly exceeded their receipts. It became necessary to effect a great reduction in their expenses, and on the 27th March at one swoop they discharged about four-fifths of their clerks, who were, however, re-engaged as their prospects improved.

The year which followed was one of great commercial disaster consequent on the French Revolution and the abdication of Louis Philippe. By the month of June, 1848, the operations of the Company had resulted in the loss of £3,220 8s., and the whole undertaking might have collapsed had not Mr. Ricardo advanced money, and taken upon himself the burden of other shareholders, whose confidence in the Company had ceased. They were at this time receiving about £100 per week for messages, and by December their actual loss had been reduced to £341 0s. 11d.

In January, 1849, they were able for the first time to speak direct without delay from London to Birmingham and Manchester. This was considered a great telegraphic feat.

In the year 1850 their gross revenue from all

sources was £48,524 8s. 9d., out of which they made a profit of £10,075 12s. 3d.

In 1851, the year of the Great Exhibition, their gross revenue was £49,866. In 1852 their receipts for messages amounted to £100 per day. In 1860 their revenue had increased to £214,245 7s. 3d., and their profits to £69,711 14s.

The 30th June, 1863, was the day fixed for the transfer of the whole system to the Post Office Department of Her Majesty's Government, but owing to various delays the actual transfer did not take place till the 28th January, 1870.

Their receipts for the thirteen months ending on this date were £425,789 2s., and their profits £202,480 6s. 2d.

On finally winding up, the Company, in addition to interim dividends (which were limited by their Act to 10 per cent. per annum), the shareholders divided among themselves a sum of £2,938,826 9s. received from the Government, and a Trust Fund of £40,721 17s., being equal to a dividend of £292 1s. 8d. per cent. upon their capital.

The Electric Telegraph Company was not, however, allowed to pursue its way without opposition. In July, 1850, the British Electric Telegraph Company obtained their Act, their engineer being Mr. Edward Highton, and in the same year the Magnetic Telegraph Company was originated, their engineer being Mr. Charles Bright, and at first they employed the electro-magnetic instrument of Mr. Henley.

These two Companies afterwards amalgamated and became a powerful rival of the Electric Telegraph Company. The United Kingdom Telegraph Company obtained their Act in 1861, their engineer being Mr. Andrews, and they also erected an extensive system of telegraphs, and introduced the Hughes Printing Telegraph.

The Electric Telegraph Company endeavored to establish a practical monopoly by either opposing or purchasing the inventions of rival patentees. Among these the chemical printing telegraph of Mr. Alexander Bain deserves especial notice. Chemical telegraphs were suggested at an early date, and in 1838 Mr. Edward Davy patented a chemically-marking telegraph of considerable merit, (employing calico tapes moistened with iodide of potassium. In December, 1846, Mr. Bain patented his system, and in addition to the use of an iron style resting on paper moistened with a solution of ferrocyanide of potassium, described the important principle of setting up the messages on perforated paper, a system which has done more to increase the capabilities of the telegraph than any other invention.

That invention was exhibited to the Electric Telegraph Company, and while being examined one of the regulating springs broke and allowed the instrument to travel round with uncontrolled speed. To their surprise they found that the whole message was visible, and had been transmitted correctly at the rate of several hundred words per minute, upon which they resolved to purchase the invention without delay. I believe Mr. Bain received £7,000 for his patent and for the withdrawal of his opposition to their Bill. They employed the system of printing on chemical paper for some years, until it was eventually supplanted by the Morse inking system. Nothing, however, was done with the punched paper until Sir Charles Wheatstone introduced his very beautiful automatic printing telegraph, which is the most rapid system of telegraphing at present in ordinary use.

The real capabilities of the Bain system remain, however, to be yet developed. The Americans have recently re-introduced it with startling results, and

have shown that on ordinary circuits four hundred or five hundred words per minute may be readily transmitted by its means.

When the capabilities of this system become generally known to the public, they will doubtless insist on enjoying the advantages to be derived from it, either in the form of lengthened messages or a lowered tariff. It appears to me, that in order to obtain the full benefits of telegraphic communication any reduction in the cost should be accompanied by the introduction of *express messages*, a species of message bearing the same relation to ordinary messages that passenger trains bear to goods trains. The cost of these messages should be at least five or ten times as great as that of ordinary messages, and they should be subject to the same rules of priority among themselves as now exist, but they should in all cases take precedence of the ordinary heavy traffic. Without some such system much of the celerity to which we are now accustomed will be lost amidst the enormous accumulation of work which must sooner or later fall upon the telegraphic system of this country. The Electric Telegraph is quite capable of transmitting a large portion of the business of the country which is now transacted by letter, and is being so employed more and more every day. If this expansion of traffic be accompanied by facilities for securing rapid transmission for important messages the pecuniary gain to the "Post-office" will be very great, while the benefits afforded to the commerce of the country will be enormous.

(To be continued.)

## NOTES OF A COURSE OF SEVEN LECTURES ON ELECTRICITY.

BY PROFESSOR TYNDALL, LL.D. F.R.S.

(Continued from page 90.)

[From the Telegraphic Journal.]

### EXPERIMENTS IN LECTURE I.

(1.) Place an egg in an egg-cup, balance a lath upon the egg; amber rubbed with the hand attracts the lath. The amber ought to be warm, and the hand dry; if the hand fails, a rub on the coat sleeve will render amber attractive.

(2.) Warm rock-crystal, or warm glass, rubbed with dry hand, also attracts lath. Gutta-percha and ebonite drawn through the hand do the same. A single stroke of a silk handkerchief considerably augments attractive force. This illustrates the influence of the rubber noticed by Newton.

(3.) Ebonite comb passed through the hair powerfully attracts the lath; comb supported by egg is in its turn attracted by lath. This is Boyle's experiment.

(4.) Ball of sulphur mounted so as to be caused to rotate rapidly, with dry hand placed against it, emits light in the dark. This is Otto von Guericke's experiment. A tall glass jar rubbed with silk smeared with amalgam yields vivid streams of "electric fire," which are seen much farther than the light from the sulphur. In all cases where the development of sparks and crackling is the object, the glass tube and rubber ought to be not only warm but *hot*.

(5.) Attraction of water and of oil by rubbed amber. An eminence forms under the excited amber, and the crest of the eminence is finally discharged against the attracting body. A strongly excited glass rod brought near the oil (contained in a very small watch-glass quite filled with the oil), raises several eminences, each of which discharges a shower of drops against the rod. This, in an intensified form, is the experiment of the Florentine Academicians.

(6.) Exhausted glass tubes, well warmed and dried, are filled, when rubbed with silk, with diffuse light. When the tubes contain uranium glass, or any other fluorescent body, the light is intensified.

(7.) Mercury in an exhausted tube, shaken to and fro, produces light, which is also intensified by the presence of uranium glass. These are the effects observed by Picard, Bernoulli, Hauksbee, and others.

(8.) Cork protruding from glass tube; pen-holder, or fir stick some feet in length, stuck into cork, attracts the balanced lath when the glass tube is excited.

(9.) The approach of the excited glass tube suffices to develop attractive power at a distance. Support long lath by warm glass tumbler; place fragments of paper, or gold leaf, under one end of lath, and bring excited tube near the other end; the two ends may be many feet apart; the light bodies are attracted.

(10.) A small plate of metal or of wood resting on a glass support—a warm tumbler would answer—is connected with one end of a wire 100 feet long, supported by loops of silk; the other end of the wire is coiled round the end of a warm and dry glass tube. Over the plate of metal or wood rests the short arm of an index, formed of a straw delicately poised. When the glass tube is excited by rubbing, the "virtue" is transmitted through the wire and communicated to the plate; the end of the index is drawn down, its arrow-head moving upwards, through a foot or more, in consequence.

(11.) When the wire is supported by loops of wire the effect is not obtained. When supported by loops of humid packthread the effect is not obtained; when, instead of the 100-foot wire we employ 100 feet of silk string, the electricity does not pass. But the silk string, when wetted, freely transmits the power. These are the experiments which led Stephen Gray to the discovery of conduction and insulation.

(12.) Support board by stout silk strings. A man stretched upon the board presents his forehead to one end of our straw index. On bringing excited tube near the man's feet his head attracts the short lever of the index, the arrow-head of which moves accordingly. If the index comes sufficiently near the forehead, a spark passes between both. This experiment unites those of Stephen Gray and Du Fay.

(13.) Silver leaf let loose in the air plunges towards excited glass tube, halts before it reaches it, and retreats. It may then be chased by the tube through the air. While thus repelled by the glass, it is strongly attracted by rubbed ebonite or gutta-percha.

(14.) A glass tube, indented at its centre, and supported on a point like a magnetic needle, is, prior to being rubbed, attracted by the excited glass tube; after being rubbed it is strongly repelled. In this condition it is strongly attracted by a rubbed resinous body. A rubbed ebonite comb, paper-cutter or ruler, properly suspended or supported, is repelled by a second peice of ebonite similarly rubbed. It is attracted by rubbed glass. Speaking generally, the rubbed vitreous body repels the rubbed vitreous body; the rubbed resinous body repels the rubbed resinous body; while the one class when rubbed attracts the other class. This is the fundamental law of electric action established by Du Fay. It is usually expressed by saying that like electricities repel, and unlike electricities attract each other.

### NOTES OF LECTURE II.

1. For a long period bodies were divided into *electrics* and *non-electrics*, the former of which were held to be capable of electrification, the latter not. It is now time to say that the distinction between

electrics and non-electrics is really a distinction between insulators and conductors. The conductors being held in the hand and rubbed, the excited electricity immediately escaped, while it was retained upon the surfaces of insulators. When properly insulated the most perfect conductor can be electrified by friction.

2. The sulphur sphere of Otto von Guericke was, as already stated, the first form of the electric machine. For this Hauksbee and Winckler substituted globes of glass; Boze of Wittenberg (1741) added the prime conductor, which was first a tin tube supported on resin, or by strings of silk. Gordon, of Erfurth, soon afterwards substituted a glass cylinder for the globe. The cylinder was sometimes vertical, sometimes horizontal. He so intensified his sparks as to kill small birds with them. In 1760 the plate-machine now in use was introduced by Planta.

3. Various attempts had been vainly made by Nollet and others to ignite inflammable substances by the electric spark. This was first effected by Ludolf, on the first opening of the Academy of Sciences at Berlin in 1744. With a spark from the sword of one of the court cavaliers present on the occasion he ignited sulphuric ether.

4. Grummert, a Pole, made various experiments on the luminous discharge through a vacuum. This we have already illustrated; but it is interesting to note that Grummert proposed to illuminate by this light mines in which ordinary flames cannot be employed, a proposal which has been revived with reference to the vacuum tubes of our day. Krüger found that the spark possessed a bleaching power, doubtless through the ozone generated, which was then unknown.

6. Dutour and Waitz, in 1745, and Dr. Watson about the same time, made further experiments on the destruction of electricity by flame. A flame connected with the earth, instantly discharges an electrified conductor; glowing embers and pointed bodies do so also, but in a less degree.

6. Dr. Watson also made numerous experiments on the ignition of bodies by the electric spark. He fired gunpowder, discharged guns, and, causing a spoon containing ether to be held by an electrified person, he ignited it by presenting to it the finger of an electrified person. He noticed that the spark varied in color as the substances between which it passed varied.

### EXPERIMENTS IN LECTURE II.

As in Lecture I. we shall employ, in part, a lath balanced on an egg as our test of attraction.

(1.) A ball of brass, of wood coated with tinfoil, a lead bullet, or an apple held in the hand and struck briskly with silk, flannel, or a fox's brush, fails to attract the balanced lath. Suspended by a string of silk and similarly struck, the attraction is decided.

(2.) A brass tube held in the hand and struck with the fox's brush, shows no attractive power; but when a stick of sealing-wax, ebonite, or gutta-percha is introduced into the tube as a handle, the striking of the tube at once develops attractive power.

(3.) The mere touching of the brass tube by the finger causes the power to disappear.

(4.) Removing the handle and exciting it by the friction of flannel, silk, or fur, it attracts lath. But it may be repeatedly touched, and still retain its power of attraction. In the case of the conductor the touching of any point causes it to yield up the whole of its electricity; in the case of the insulator only the spot touched yields up its electricity.

(5.) The human body was ranked among the non-electrics. I stand on the floor and permit an assistant to strike me briskly with the fox's brush. I

present my knuckle to the balanced lath, but there is no attraction. Placing a board on four warm glass tumblers I stand on it; a few strokes of the fur suffice to develop a strong attractive power. Presenting my knuckle to that of my assistant, who stands on the ground, a spark passes between us. If I stand upon a cake of resin, of ebonite, or upon a sheet of good india-rubber, the effect is the same.

This action is considerably augmented by throwing a mackintosh over the shoulders and having it struck.

(6.) Thus non-electrics, like electrics, can be excited; the condition of doing so being that an insulator shall be interposed between the non-electric and the earth.

(7.) A sheet of foolscap, well warmed, so as to expel the humidity which paper always imbibes from the air, placed on a hot board, becomes strongly excited when india-rubber is passed over it. It resists removal from the board, and when torn away attracts the balanced lath from a considerable distance. If brought near a wall it will move up to it and cling to it.

(8.) Two strips cut from the excited foolscap, as it lies upon the hot board, are placed one upon the other. When laid hold of at one end and separated from the board, they violently repel each other. This is a consequence of the fundamental law already illustrated.

(9.) The gold leaf electroscope acts in the same way. When electricity is communicated to the metal top of the instrument it diffuses itself immediately over the gold leaves, which then repel each other like the strips of paper. The lightness of the gold leaf enables it to respond to very feeble charges of electricity.

(10.) A simple and effective electroscope for teaching purposes (devised by Mr. Cottrell) may be formed of a straw about 18 inches or 2 feet long. Within two or three inches of the blunt end of the straw, a second or thinner straw about an inch long is passed transversely through the first. Half a stick of sealing-wax is stuck against an upright support, and a sewing-needle is fixed in the sealing-wax. This needle is introduced into the transverse inch of straw and serves as a horizontal pivot. The blunt end of the straw carries a little weight, just sufficient to keep the straw vertical. Thus arranged the straw is very mobile. It is attracted by any electrified body; but on touching the body it is charged and immediately repelled, the sealing-wax preventing the escape of the electricity. The straw index moves over a graduated arc.

(11.) The electrical machine, beginning with its first form as a sphere of sulphur, then as a globe of glass, then as a cylinder vertical and horizontal, then as a plate of glass, and finally as a plate of ebonite, was illustrated by examples.

(12.) Standing on an insulating stool and placing one hand on its prime conductor, the ebonite machine was worked; the knuckle being brought down upon a spoon containing sulphuric ether, a spark passed, and the ether was ignited. The spoon was next held in the hand of the excited person, and ignited by a spark from the knuckle of another standing on the earth. These are the experiments of Ludolf and Bishop Watson.

(13.) The presentation of the point of a penknife to the prime conductor at a distance of three inches prevented almost wholly the charging of the conductor.

(14.) Mounting a pointed rod upon the prime conductor, a strong cool wind issued from the point

when the machine was worked. This wind was competent to blow aside a sheet of paper. When the point was turned downward the "electric wind" forcibly depressed the flame of a candle placed underneath the point. Franklin, as we shall afterwards learn, turned these experiments to important account.

(15.) A cross was formed of four wires, the pointed ends of which were all bent in the same direction so as to form a right angle. A brass axis passing through the intersection of the arms of the cross was permitted to rest upon two parallel wires supported by glass rods. One of the parallel rods being connected with the conductor of a machine, the whole system was electrified. From every point issued the "electric wind," the reaction of which caused the cross to rotate and roll from one end to the other of the parallel bars. This is a form of the "electric mill," devised by Hamilton.

(16.) The electric wind from a glowing body was shown by the sweeping away several times in succession of the black smoke from a wax taper after the flame was extinguished. The wick of the taper was here connected by a wire with the electrical machine. This and the last experiment were made after the manner of Canton, who employed in his observations the shadows of electrified threads, instead of the threads themselves.

(17.) The quickening of the flow of water by electricity was shown by suspending a metal bucket from an insulated arm, and connecting it with the electric machine. Through a small orifice in the bottom of the bucket water dropped slowly; when the machine was worked the drops quickened to a continuous stream.

#### PROCEEDINGS AT THE PHYSICAL SOCIETY, FEB. 27th, 1875.

Mr. Willis, F. C. S., submitted to the Society apparatus which he had devised for exhibiting the sodium spectrum to an audience. The experiment, as usually shown, consists in volatilizing the metal or one of its salts between the carbon poles of a battery, and in projecting the spectrum on to a screen. The method is imperfect, as the characteristic lines of sodium are always associated with the continuous spectrum of the electric light. Mr. Willis prefers, therefore, to obtain a sodium flame by burning hydrogen which has been passed over the surface of molten metal; by this means a pure sodium spectrum may be thrown on the screen.

Professor McLeod suggested that other metals might be introduced into the hydrogen flame in a finely-divided state, and that the continuous spectrum might be eliminated by employing a horizontal slit.

Professor G. C. Foster then read a paper by himself, and Mr. J. O. Lodge "*On the Lines of Flow and Equipotential Lines in a Uniform Conducting Sheet.*" The first experimenter who worked on this subject was Kirchhoff, who used plates of copper, but owing to their small dimensions his measurements were imperfect. Quincke employed rectangular plates, and afterwards discs of lead and copper conjointly, so that he obtained a difference of potential at the junction. The next experiments were made by Professor Robertson Smith, who used conducting discs of tin-foil and deduced equipotential lines from the lines of flow. Professor Foster stated that the general mathematical theory had been fully established by Kirchhoff, who had verified it experimentally in all its main features. The object the authors of this paper had in view was to show that Kirch-

hoff's results can be arrived at by very simple mathematical processes, if each electrode by which electricity is supplied to or taken from the sheet be regarded as producing everywhere the same effect as it would if it were the only electrode in the sheet. The electrical condition of every point in the sheet thus appears to result from the simple superposition of the effects due to the several electrodes.

This mode of treating the question has been adopted by Professor Robertson Smith; but his paper was in the main addressed to mathematical readers. It was the aim of the authors, however, to show that the chief results could be established by elementary methods, which can be included in ordinary class teaching. The paper contained, in addition to the mathematical discussion of the subject, a description of an experimental method of laying down the equipotential lines on a conducting surface, so that the difference of potential between any two consecutive lines may be constant. Measurements were also given of the resistance of discs of tin-foil of various sizes, and with the electrodes in various positions. The results agreed closely with the calculated values, and thus supplied a verification of the theory which Kirchhoff had been unable to obtain, in consequence of the small resistance of the discs used by him.

Mr. Latimer Clark made some observations on the methods by which contact was made between the electrodes and the conducting sheet, and Professor Adams then described some of the results which he had just communicated to the Royal Society "*On Lines of Force.*"

**NEW LIGHTNING PROTECTOR FOR TELEGRAPH LINES (LEMASSON SYSTEM).**—Among the different lightning protectors invented to protect telegraph lines, one of those most used is formed of two plates furnished with points and insulated from each other, one plate being traversed by the line current, and the other placed in communication with the earth. So long as atmospheric electricity is moderate the current goes through the first plate only, but when excessive it runs to earth through the points and the second plate. M. Lemasson proposes to render such a lightning protector of greater efficiency. He places a tube inside a conducting mass, provided with 100 transverse striates, and in immediate contact with earth. A cylinder communicating with the line occupies the centre of the tube, but does not touch it, and is provided with 40 longitudinal striates. By reason of the different direction of the striates, 4,000 crossings are obtained—uniformly distant  $\frac{1}{4}$  a millimetre from each other—and these crossings may be regarded as so many points. Hence, although measuring only 1 decimetre in length by 4 centimetres wide and broad, M. Lemasson's arrangement, though much smaller, is more efficient than in ordinary use. An important addition to the apparatus is the insertion of a pipe (furnished with a stop-cock) to the air-space between the "tube" and the "conducting mass," so as to rarefy the air, and thereby diminish the resistance offered to the discharge of excessive atmospheric electricity.—*Journal Telegraphique.*

**ELECTRO-MAGNET WITH CONCENTRIC TUBES.**—*M. Camacho.*—The principle of the apparatus is that of tubular magnets. A central iron tube is surrounded with a helix of copper wire furnished with an insulating coating. Around it is another iron tube with its helix, and then a third, likewise with a helix. The effect is said to be beyond all comparison greater than that of any previously devised arrangement.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, April 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

On and after Saturday, May 1st, 1875, the use of the State rates to and from Canada will be discontinued, and offices will resume the old method of charging for messages to and from the Montreal Telegraph Co.'s offices in Canada.

The "Tariff for other lines" from Western Union connecting points will be 30 and 2. The offices connecting the Western Union with the Montreal Telegraph Company's offices in Ontario, Quebec and New Brunswick are Buffalo, N. Y., Detroit, Mich., Montreal Junc., Stanstead, Que., and Sackville, N. B.

The route of business to Canada will remain unchanged.

Jemison, Ala., closed.

On and after April 15th the following offices in Cape Breton Island, now on other lines, will be checked direct as Western Union offices. The tariff from Western Union offices west of New Brunswick will be the State rate, if there be any to Cape Breton Island, or, if there is none, 30 cents more than the rate to Port Hastings. The tariff from offices in New Brunswick and Nova Scotia will be 50 and 2.

Arlchat.	Hawkesbury.	Mabon.
Ashpee Bay.	Indian Brook.	North Sydney.
Baddeck.	Ingonish, or	Port Hood.
Black River.	Ingoniche.	St. Peter's.
Bridgeport.	Lingan.	South Sydney.
Cape North.	Little Grace Bay.	Whycomagh.
Cow Bay.		

Mt. Pleasant, Del., closed.

Fairburn, Ga., closed.

Milner, Ga., closed.

Thomson, Ga., closed.

Disco, Ill., reopened.

Grasshopper Falls, Kansas, changed to Valley Falls.

Howard Station, Cass Co., Mich., changed to Dalley.

Monteau, Mo., closed.

White Tall, Mon., closed.

Passekeag, N. B., is in square 4. Owing to a misprint, the square was not shown on a number of the JOURNALS.

The office at Newton, N. H., is closed. Business will hereafter be delivered from Newton Junction; charges for delivery 50 cents. Check Newton Junc.

Messages taken for Angelica, Belfast, Oramel and Canadea, N. Y., are delivered by stage from Belvidere, N. Y.; charges for delivery, 30 cents.

Green Springs, Ohio, reopened.

Columbia, O., square 180, (open JOURNAL Feb'y 1, 1875), is in Lorain, Co. P. O. Address, Columbia Station.

Business for Pioneer, Pa. (office closed in JOURNAL, June 15, 1874), can be delivered from Petroleum Centre, Pa.; charges for delivery, 35 cents.

Causapscal, Que., closed.

Lovelady, Texas, closed.

Highland, Texas, closed.

The following offices in Utah are closed:

Coalville.	Hampton.	Paris.	Springtown.
Eureka.	Livan.	Pleasant Grove.	Smithfield.
Granite City.	North Star.	Scipio.	

Hereafter the "tariff for other lines" from Salt Lake City and Ogden to points given in Utah will be as follows:

Alta City,	50	+30	from Salt Lake City.
Farmington,	35	+10	" "
Hebron,	100	+40	" "
Kaysville,	35	+10	" "
Little Cottonwood Mines,	50	+30	" "
Logan,	50	+30	from Ogden.
Panacea,	150	15	from Salt Lake City.
Pine Valley,	100	+40	" "
Richfield,	75	+30	" "
Sandy Sta.,	35	+10	" "
Silver City,	75	+30	" "

† For each additional five or fraction of five words.

Bitter Creek, Wy., is now a Western Union office, square 550, check direct.

## NEW OFFICES.

307 Lombard, Ill.  
318 Sidney, Ill.  
236 Sublette, Ill.  
273 Hardenburg, Ind., P. O. Six Mile, Jennings Co.  
407 Le Grand, Iowa.  
456 Valley Falls, Kansas (formerly Grasshopper Falls).  
• Shell Island, La., 50 5 from Brashear City.  
148 Deep River, Mich., check Standish.  
270 Dalley, Mich., (formerly Howard Sta., Cass Co.)  
21 Newton Junction, N. H.  
41 Greenville, N. J., check Bergen Point.  
46 Central Valley, N. Y.

• Attica, O.	45 3	from Deshler, O.
	80 5	from Chicago, Ill.
• Holgate, O.	35 3	from Deshler, O.
	75 5	from Chicago, Ill.
170 Glasgow, O. P. O. care W. U. Tel. Co., Port Washington.		
140 American Transfer Sta., Clarion Co., Pa.		
• Lawrence, Texas,	65 4	from Marshall.
	50 3	from Dallas.

To OFFICES HAVING "SHEET C" add Nora Springs, Iowa, square 46, to your "Sheet C."

## ATLANTIC CABLE BUSINESS.

## REDUCTION OF RATES.

On and after May 1st, 1875, the tariff for Atlantic Cable messages to Great Britain, Ireland and France will be as follows:

NOTE.—The 10 word minimum on business to or from Great Britain, Ireland and France is abolished.

From New York City and all points in Nova Scotia, New Brunswick and New England States.....	50 cts.
From all points in New York (except New York City), New Jersey, Pennsylvania, Delaware, Maryland and District of Columbia.....	58 "
From all points in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan and Wisconsin, from St. Louis, Mo., and from Western Union Company's offices in Florida.....	65 "
From all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dacotah, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada, California, Arizona, Oregon and Washington Territory.....	70 "
British Columbia.....	85 "

NOTE.—The rates to points beyond France, which have heretofore been computed by adding to the rate for ten words to London (or the rate to France) will now be found by computing the rate by word to London, and then adding the rate beyond given in the tariff book. Thus: A message of 5 words from New York City to Germany will be \$2.50 to London, and \$1.10 London to Germany, total \$3.60. At present the rate (on a 5-word message) is \$10 for ten words or less to London, and \$1.10 for 20 words or less London to Germany, total \$11.10.

We are notified that the cable between England and Guernsey (Channel Islands) is broken. Messages for the Channel Islands will therefore be sent via France only. Tariff, \$1.85 for 20 words or less, in addition to the rate to France.

## CUBA CABLE BUSINESS.

We are notified that an extra charge of five cents for postage (in addition to the government tariff of 40 cents) should be collected on all messages to Remedios, Calbarien, Trinidad, and points beyond Santa Clara, Cienfuegos and Sagua, in the Island of Cuba.

On and after May 1st, 1875, the tariff to Santiago will be as follows:

From Western Union offices east of Mississippi River, including St. Louis, Mo., \$6.75 58.  
From Western Union offices west of Mississippi River (except St. Louis, Mo.), and from New Brunswick and Nova Scotia, \$7.75 68.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, April 6, 1875.

On April 19th, Grenada, Miss., will be added to the list of Money Order Offices in Jas. Compton's district.

GEO. H. MUMFORD, Vice-Pres't.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

New York, April 10, 1898.

## ASSESSMENT No. 74.

4, 8, 16, 21, 23, 29, 53, 56, 58, 61, 64, 67, 76, 77, 86, 88, 90, 95, 103, 113, 121, 122, 131, 134, 138, 143, 145, 146, 157, 176, 177, 179, 181, 201, 202, 208, 211, 217, 235, 244, 257, 267, 269, 276, 277, 280, 289, 301, 312, 342, 346, 352, 367, 383, 385, 394, 402, 405, 406, 413, 414, 416, 425, 434, 463, 464, 467, 509, 516, 536, 538, 539, 546, 547, 548, 549, 553, 564, 577, 579, 587, 594, 604, 615, 626, 649, 671, 673, 691, 721, 731, 740, 742, 769, 787, 815, 830, 832, 843, 856, 858, 859, 873, 885, 912, 915, 917, 923, 928, 933, 941, 952, 965, 1001, 1011, 1013, 1024, 1039, 1054, 1055, 1061, 1088, 1090, 1126, 1147, 1154, 1169, 1173, 1178, 1182, 1188, 1199, 1306, 1325, 1322, 1323, 1367, 1376, 1382, 1390, 1396, 1395, 1399, 1398, 1345, 1367, 1358, 1368, 1394, 1398, 1402, 1403, 1404, 1409, 1410, 1412, 1440, 1444, 1453, 1484, 1489, 1508, 1516, 1517, 1518, 1554, 1560, 1568, 1569, 1571, 1572, 1615, 1619, 1630, 1632, 1635, 1632, 1723, 1729, 1732, 1735, 1790, 1815, 1817, 1831, 1852, 1852, 1899, 1894, 1900, 1901, 1906, 1911, 1913, 1914, 1944, 1957, 1965, 1970, 1986, 2019, 2021, 2027, 2029, 2030, 2036, 2044, 2049, 2066, 2062, 2063, 2097, 2135, 2164, 2174, 2178, 2181, 2190, 2191, 2194, 2195, 2197, 2201, 2203, 2213, 2214, 2223, 2224, 2228, 2229, 2233, 2240, 2241, 2243, 2257, 2259, 2263, 2269, 2273, 2275, 2277, 2285, 2287, 2294, 2310, 2312, 2322, 2330, 2331, 2333, 2334, 2335, 2336, 2337, 2341, 2343, 2344, 2345, 2347, 2350, 2354, 2355, 2356, 2360, 2367, 2371, 2378, 2382, 2386, 2399, 2400.

## ASSESSMENT No. 73.

31, 39, 54, 171, 206, 228, 248, 252, 316, 360, 456, 466, 468, 469, 470, 471, 475, 481, 482, 514, 527, 556, 557, 560, 561, 572, 575, 618, 710, 712, 717, 725, 730, 733, 764, 781, 782, 783, 785, 786, 802, 813, 836, 838, 869, 876, 899, 904, 906, 908, 936, 944, 1014, 1016, 1028, 1041, 1057, 1069, 1072, 1102, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1125, 1131, 1141, 1317, 1234, 1233, 1243, 1256, 1261, 1283, 1284, 1285, 1286, 1295, 1375, 1405, 1431, 1432, 1433, 1434, 1435, 1436, 1471, 1474, 1476, 1497, 1528, 1529, 1530, 1537, 1558, 1569, 1590, 1597, 1610, 1611, 1612, 1616, 1649, 1673, 1676, 1678, 1699, 1700, 1701, 1703, 1704, 1718, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1769, 1771, 1803, 1813, 1833, 1853, 1855, 1917, 2004, 2023, 2045, 2055, 2094, 2112, 2165, 2170, 2171, 2236, 2237, 2256, 2266, 2267, 2284, 2286, 2292, 2301, 2325, 2326, 2332, 2369.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

MR. GREENWOOD, who has been for several years past Superintendent of the San Francisco, Cal., Fire Alarm Telegraph, has resigned that position, to take charge of the American District Telegraph in that city, as General Superintendent. Mr. James S. Urquhart, formerly of the San Francisco Western Union Telegraph office, has been elected to fill the vacancy caused by Mr. Greenwood's resignation.

MR. A. L. DICK has resigned the Superintendency of the Telegraph Department of the N. Y. C. & H. R. R. R., and Mr. W. A. Graves has been appointed to fill the vacancy.

MR. H. C. ROBINSON, Assistant-Manager of the Philadelphia office, has been appointed Manager, in place of Mr. James Merrihew, appointed Superintendent.

## BORN.

CONWAY.—At Kenney, Ill., March 7th, 1875, to Wm. Conway, Agent and Operator I. M. R. R., a daughter.

JEUNET.—At Franklin, Pa., March 24, 1875, to Ernest Jeunet, Manager W. U. Tel. Office, a son.

## DIED.

TUBBS.—At Chicago, March 25, 1875, Maria E., wife of F. H. Tubbs, aged 33 years and 1 day.

**MEDITERRANEAN TELEGRAPH.**—The half yearly meeting was held on March 9, at the London Tavern, Mr. H. Moor presiding. The report stated that the cables and land lines of the company had been maintained in perfect order, and so remained at a small outlay. The directors recommended the payment of the usual half yearly dividend on the 8 per cent. preference stock of the company, less income tax, and of a dividend at the rate of 3 per cent. per annum on the ordinary share capital, free of income tax, payable on and after the 15th inst., which would leave £501 to be carried to the reserve fund. The Chairman, in moving the adoption of the report, said the traffic had fallen off very considerably from the competition of the Eastern Telegraph Company. They had hopes that some of the lines contemplated would enable them to make a better show by the next meeting. There was a talk of some lines being constructed that would be beneficial to the company. Their line to Modica was laid down sixteen years ago, and was now in excellent order. Sir J. Carmichael seconded the resolution for the adoption of the report. A shareholder suggested that the expenses might be reduced, but the chairman explained that the directors might forego their fees, but that would not benefit the shareholders. The agreement with the Government had seven and a half years to run, and they paid the company £7,200 a year. The report was adopted, the dividend on the preference stock at the rate of 8 per cent. per annum was declared, less income tax, and the dividend on the ordinary stock was declared at the rate of 3 per cent. per annum, free of income tax, both payable on the 15th inst.

**INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS.**—The ordinary general meeting was recently held at the City Terminus Hotel, Mr. G. Henderson in the chair. The chairman, in moving the adoption of the report and accounts, said the most important point in the report was the statement of the suit with the West India and Panama Telegraph Company. Their claim against that company was for £179,964, but it had now been written off, the directors thinking it better to settle the question. It had been asked whether the company had ever derived any profit from the contract with the West India Company, and in reply to that question he thought that there was no doubt that they had. Their investments in other companies were £130,690. They were made up of three lots of shares—namely, 5,065 Direct Spanish Ten per Cent. Preference Shares, which were valued at par; 9,840 ordinary shares of the same company, which were valued at £6 per share. They were now quoted at £7 10s., and they anticipated a still further improvement. The remaining shares were 2,100 in the West India Company. As regarded the Peruvian and Chilean Expedition, the International would go down the river that day. The expedition was a very important matter, and they anticipated great results from it. The cables had been tested by independent electricians of eminence, and the result was most satisfactory. With regard to their usual business, it was very good and they were earning a fair profit.

Mr. Hancock said he thought the position of the company was most unsatisfactory, as were also the accounts. The directors' policy of depending upon speculative cables was injurious to them all. He concluded by moving that the report and accounts be received and considered, and that five independent shareholders be appointed to confer with the directors as to the position of the company, and as to what should be done to promote its interests, and report thereon to the shareholders.

The Chairman, after replying to various questions, put Mr. Hancock's amendment, the first portion of which was rejected, the report and accounts being unanimously adopted. The portion referring to the appointment of a committee was agreed to.

The retiring director and auditor having been re-elected, Mr. Weiss was appointed an auditor, vice Mr. Glover resigned.

**DIRECT SPANISH TELEGRAPH.**—The report shows a balance to the credit of profit and loss of £5,372, out of which £2,729 will be required for the payment of the half year's dividend on the 10 per cent. preference shares, leaving £2,643 for a dividend of 3s. per share on the ordinary shares, and £703 to be carried to the reserve fund. It is added that the cable between Marseilles and Barcelona, purchased last September, continues in perfect working order, and that traffic has been resumed on the Santander cable.

**EASTERN TELEGRAPH.**—The directors announce that an interim dividend of 2s. 6d. per share, free of income tax, will be paid on the 14th of April in respect of profits to the 31st of December, 1874.

The receipts of the Submarine Telegraph Company for the month of February, 1875, amount to £8,246. The receipts for the corresponding month of February the preceding year amounted to £8,844.

The traffic receipts of the Eastern Extension (Australia and China) Telegraph for the month of February last amounted to £16,415, and for the same month in 1874 to £17,706.

The number of messages sent by the Cuba Submarine Telegraph during the month of February was 2,079, estimated to produce £2,200; as against 683 messages, producing £478, in the corresponding month of last year.

The traffic receipts of the Eastern Telegraph Company for the month of February last amounted to £32,765, and for the nine months in 1874 to £31,064.

The traffic receipts of the Great Northern Telegraph Company for the month of February amounted to 256,146fr., against 298,606fr. last year, and its total traffic receipts, 1st January to 28th February, to 522,167fr., against 617,672fr. last year.

The traffic receipts of the Western and Brazilian Telegraph Company for messages for the four weeks ending the 26th of February amounted to £8,842.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 27th of February, 1875, was 350,846; and during the corresponding week of 1874, 329,245; increase in 1875 over 1874, 21,601.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 6th of March, 1875, was 352,293; and during the corresponding week of 1874, 336,979; increase in 1875 over 1874, 15,314.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 13th of March, 1875, was 367,005; and during the corresponding week of 1874, 335,400; increase in 1875 over 1874, 31,605.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 20th of March, 1875, was 389,003; and during the corresponding week of 1874, 343,098, being an increase in 1875 over 1874 of 45,905.

## THE SERVICE.

### WESTERN UNION TELEGRAPH COMPANY FEBRUARY, 1875.

#### APPOINTMENTS.

J. A. Hern, Broadway & Dey st.	R. W. Pudman, Petrolia, Pa.
J. Borst, " "	H. A. Chase, Titusville, Pa.
D. S. Barclay, " "	H. M. Bunell, Pittsburgh, Pa.
E. L. Class, " "	L. A. Langworthy, Titusville, Pa.
E. P. Colton, " "	Miss E. A. Houghton, Bay City, Mich.
D. Dowling, " "	Miss K. A. Henry, Buffalo, N. Y.
J. Drummond, " "	G. F. Lowe, Cleveland, O.
J. G. Dunn, " "	E. T. Tindall, " "
J. Elliot, " "	W. B. Blair, Detroit, Mich.
E. J. Foy, " "	T. B. Spalding, Grand Rapids, Mich.
J. M. Finger, " "	Miss E. M. Hopkins, Muskegon, Mich.
A. Goebel, " "	C. Burgh, North Lansing, Mich.
C. F. Habliston, " "	W. W. Hunter, Sankusky, O.
C. F. Kushbaum, " "	C. F. Hunt, Indianapolis, Ind.
Wm. Miller, " "	W. J. Howe, Logansport, Ind.
D. McKeen, " "	F. M. Speed, Cincinnati, O.
J. Moffatt, " "	J. L. Teague, Vincennes, Ind.
J. F. Tobir, " "	Miss M. Horan, Chittanooga, N. Y.
W. J. Morgan, " "	J. W. Walker, Horseheads, N. Y.
W. J. Morrison, " "	S. E. Kelley, Charleston, Tenn.
M. J. O'Neill, " "	W. W. Wooten, Keyville, Va.
P. Shirley, " "	T. L. Hodges, Rocky Pt., N. C.
M. Sullivan, " "	W. F. Bassett, Bowling Green, Ky.
Miss L. B. Moore, Broadway & Dey street.	Miss D. A. Smith, Versailles, Ky.
Miss E. F. Orr, Broadway and Dey street.	G. W. McKenzie, McKenzie Sta., Ky.
L. S. Eddy, Grand Central Hotel.	D. G. Breed, Murfreesboro, Tenn.
C. H. Jennings, 50 Pine street.	B. F. Pilon, Worthville, Ky.
J. E. Koeber, Harlem.	J. H. Miller, Hollow Rock, Tenn.
G. F. Lane, Washington Mkt.	T. W. Johnson, Whitesides, Tenn.
W. H. Murphy, 812 6th avenue.	C. Pope, Nortonville, Ky.
Winckler, 620 Hudson street.	C. H. William, Pine Bloom, Pa.
J. L. Hall, Bowdoinham, Me.	J. H. Morgan, Tennessee, Ga.
Miss J. A. Osgood, Haverhill, Mass.	J. W. Norris, Aiken, S. C.
S. A. Howe, jr., Malden, Mass.	C. D. Root, York, Ala.
D. F. Hegarty, Winthrop, Me.	J. Y. Borden, Bridgeton, N. J.
H. R. Ford, Barton, Vt.	W. H. Shepler, Carlisle, Pa.
G. F. Currier, Henniker, N. H.	F. W. Aldridge, Chestertown, N. C.
L. M. Weeks, W. R. Juct., Vt.	D. Miller, Jersey City, N. J.
P. Pierce, East Hampton.	W. Wiseman, " "
E. A. Conroy, Fall River, Mass.	F. W. White, " "
A. M. Kemp, Provincetown, Mass.	J. E. Buch, " "
Miss A. F. Fulton, Greenville, N. J.	E. A. Hobbs, Mountain Station, Pa.
H. E. Jones, Thomson, N. J.	P. J. Seibert, Mt. Union, Pa.
W. S. White, Cairo, Ill.	R. H. Shindel, Sellin's Grove, Pa.
F. L. Osborne, Davenport, Ia.	F. B. Roane, Hammond, Ga.
F. B. Pickering, Waterloo, Ia.	
J. C. Dillong, Marshall, Tex.	
W. L. French, St. Louis, Mo.	
J. W. Hayes, " "	
Ed. Mashkoff, F. Hall, Idaho.	
W. A. Stevely, Millerstown, Pa.	
Geo. Bausman, Oil City, Pa.	
Geo. Ross, " "	
J. Moreland, Parker's Landing, Pa.	

#### RESIGNATIONS.

Miss L. H. Nash, Broadway & Dey street.	R. Cousin, Detroit, Mich.
Miss L. H. Snow, Broadway & Dey street.	Miss H. E. Bostwick, Grand Rapids, Mich.
John King, Broadway & Dey st.	A. A. Peck, Jackson, Mich.
W. J. Dealy, " "	J. H. Bradley, " "
Charles King, " "	J. B. Tallawall, Sandusky, O.
E. Cockey, " "	C. W. Clegg, Toledo, O.
C. S. Shriver, " "	P. J. Foley, Cincinnati, O.
D. Doran, " "	J. F. Hansifer, Vincennes, Ind.
M. Fanning, " "	A. J. Lorver, Chittanooga, N. Y.
C. D. Hoyt, " "	Gre. Serger, Horseheads, N. Y.
L. T. Miller, " "	T. B. Rae, Syracuse, N. Y.
W. Britton, " "	J. P. McHugh, Henderson, N. C.
R. S. Beaver, " "	J. J. Reeves (dead), Keyville, Va.
R. Weise, " "	D. D. Miller, Rock Point, N. C.
B. C. Edwards, Butter & Cheese Exchange.	E. E. Allen, Bowling Green, Ky.
J. J. Johnson, 812 6th avenue.	J. Sands, Brentwood, Tenn.
J. W. Pippitt, 520 Hudson st.	R. S. Yankesley, McKenzie, Tenn.
C. E. Murray, Lincoln, Me.	Alex. Hill, Murfreesboro, Tenn.
E. Cory (dead), Winthrop, Me.	J. W. Woolsams, Medway, Ky.
F. M. Perry, Barton, Vt.	W. B. Sumser, Worthville, Ky.
Miss M. J. Osborne, Henniker, N. H.	T. W. Johnson, Hollow Rock, Tenn.
F. H. Wheeler, W. R. Junct., Vt.	F. R. Allison, Whitesides, Tenn.
A. G. Coffin, Fall River, Mass.	R. A. Long, Nortonville, Ky.
J. H. Smith, Provincetown, Mass.	W. S. Tenell, Cairo, Ga.
G. F. Barberie, Greenville, Mass.	R. E. Walker, Pine Bloom, Ga.
R. S. Harris, Thomson, Mass.	J. B. Hudson, Jacksonville, Ala.
— Moffat, Davenport, Iowa.	W. L. Locke, Stonewall, Ala.
— Shaw, Waterloo, " "	— Moore, Winchester, Miss.
C. D. Meserve, Galveston, Tex.	C. E. Bowyer, York, Ala.
W. S. Burrows, Marshall, " "	R. D. Borden (dead), Bridge-ton, N. J.
A. Brewer, St. Louis, Mo.	H. W. Kieden, Baltimore, Md.
S. A. Langworthy, Millerstown, Pa.	A. A. Biegler, Carlisle, Pa.
P. J. McKeever, Oil City, Pa.	G. W. Eastlake, Jersey City, N. J.
H. M. Burrell, Petrolia, Pa.	D. G. Drake, Mt. Union, Pa.
J. E. Moreland, Pittsburgh, Pa.	J. S. Buxton, Olney, Md.
W. A. Stevely, Titusville, Pa.	J. W. McConnell, Squam, N. J.
J. T. Cooper, Bay City, Mich.	G. F. Jones, Jersey City, N. J.
E. H. Thresher, Buffalo, N. Y.	T. J. Kavanagh, Jackson, Miss.
A. Desson, Cleveland, O.	
J. T. Hanford, " "	

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, APRIL 15, 1875.

### THE DIRECT CABLE.

We learn by a telegram from London that the steamship *Faraday* sailed from Gravesend on April 5th to complete the work of laying the Direct United States Cable. It will be remembered that, after many futile attempts during 1874, the *Faraday* relinquished her efforts to bring the cable to land and returned to England to refit, leaving the cable buoyed at a point some two hundred miles from the American coast.

PRESIDENT ORTON arrived at Liverpool on Tuesday, the 7th instant, in excellent health. The voyage was very pleasant.

THE regular quarterly dividend of the Western Union Telegraph Company, two per cent., declared March 10th, is payable at the office of the Treasurer of the Company, Western Union Telegraph Building, on and after April 15th. The transfer books are closed until April 16th.

THE Executive Offices of the Gold and Stock Telegraph Company have been removed from their old quarters at No. 61 Broadway to the new Western Union building, and it is expected that in the course of a week the entire operating force will take possession of their new quarters. The private line department came in a week or more ago.

SUPERINTENDENT R. STEWART, formerly of the Camden and Amboy Railroad Telegraphs, at Trenton, New Jersey, is now superintendent of the Seventh District, Southern Division (formerly the Tenth District, Eastern Division), of the Western Union Telegraph Company, with headquarters in Baltimore, Md., in the place of Aug. G. Davis, re-

signed. Mr. Stewart takes to his new position an excellent reputation both for skill in his profession and also for personal worth.

### PROTECTION FROM LIGHTNING.

Now that the season of lightning storms approaches, it may be well to state the most advanced views held by scientists on the modes of protection therefrom. A question has been raised, in the discussion respecting lightning conductors, as to the advantage of a multiplicity of points at the summit, instead of the one usually employed. On this subject experience seems to have clearly taught that the greater the number of points presented, there will be, within certain limits, a proportionate protection by the exhaustion of the elements of danger. This may be accomplished not only by multiplying rods, but by increasing the number of points on the same rod, and causing them to point in different directions. Another question is as to whether lightning rods should be carefully insulated, as many contend, or be purposely connected with the metals and walls of buildings. The bulk of testimony, both by experts in America and in Europe, is that all exposed metals, such as metallic roofs, gutters, &c., should be connected carefully to the lightning rod. We believe this is the decided opinion of Prof. Henry, and of all our noted scientists, and is presumably correct. In Europe, M. Melsen has formalized this opinion as follows: "*All metallic pieces of tolerable size should be put in communication with the lightning conductors so as to form closed metallic circuits, that is to say, by two points, or at least to two conductors.*"

### THE SIGN LANGUAGE.

While skimming over the stray articles in the *omnium gatherum* column of an exchange recently, we came across a curious item which served to exemplify the adaptability of the telegraphic alphabet and its value as a means of communication when all others had failed.

A man in middle life lay dying one night in a Western city. The bodily powers had been gradually fading, and life's candle was nearly out. The voice at last gave way and only the eye and the weak throb of the pulse gave signs of life. Presently those who watched him noticed an effort to communicate something, and a troubled look in the eyes, because, apparently, it could not be done.

Just then an old companion in labor entered. They had been operators and had worked together on the wires. By some instinctive perception of the circumstances the friend approached, their hands were grasped, when there was at once observed a feeble attempt on the part of the dying man to manipulate with his weak fingers a message in the language of the telegraph. Pen and ink were procured, the message taken, written down and read to him. A gleam of satisfaction passed over his features, then the eyes closed, and the lights were out.

Such is the story. It may be true. If so, is there

not something suggestive in it? Are there not many cases where a similar ability might relieve a troubled spirit and convey important messages to the living?

### THE OHIO LEGISLATURE AND THE TELEGRAPH.

During the present session of the Ohio Legislature much of the time of the lower branch has been occupied in endeavoring to "regulate" the charges made by the telegraph companies for the transmission of messages within the borders of that State. The matter was finally referred to a Special Committee on Railroads and Telegraphs, which appears to have considered the subject in a rational manner, judging from the report submitted to the House, from which we extract the following:

"Not only have we found little if any complaint against telegraph companies in a correspondence of seven hundred letters, but many of our correspondents speak in the most favorable terms of their management and the accommodation they afford. The Western Union Company own and operate the principal lines in Ohio. Of its financial management we know nothing. It seems, at times, to have absorbed its rivals and taken their places, but whether by means other than fair does not appear, and the just presumption is, and ought to be, that the taking in process has grown out of the fact that the business of the country does not or has not required two or more lines. It is only natural that one great business enterprise like this should desire to have a monopoly of the business.

The opening up of long lines of telegraph in new and sparsely settled districts is attended with enormous expense, and meets little present return. But the question of one or more companies must, we think, be left to the laws of supply and demand. Legislation has done its part when it keeps open the door to admit competition, and places no obstacles in the way of new companies, and offers no better or special facilities to old ones. The Western Union Telegraph Company is a corporation under the laws of New York, but it seeks and enjoys certain rights, privileges and franchises under the legislation of Ohio; and hence, in return, we do not hesitate to hold that legislation may regulate, within reasonable limits, its charges and the details of its management. There is, however, one serious difficulty in the way of this, even if it were demanded, and that is the fact that the lines of a telegraph company are entireties, covering the whole country, crossing State lines, and forming a network of the States. Hence, for one State to attempt to regulate prices would be a most complicated undertaking, and one difficult of accomplishment. The net profits of telegraph stock from Ohio business have been, for years, small, or at least moderate, and, since the testimony taken by us, the Western Union has reduced its rates very materially, whether with a view of breaking down its present apparently formidable rival, and then again advancing rates, or to meet a demand so urgent for cheap means of communication, we do not know. We hope and believe the latter is true, and it is significant that, at a time when this company has made this material reduction in the cost to the people of intercommunication, Congress should have seen fit to double the rates of postage on many of the classes of mailable matter. It may yet be found that to private enterprise and private skill will be remitted the whole business of mail and news carrying."

## A MERITED PROMOTION.

It gives us much pleasure to learn that Mr. James Merrihew, Manager of the Philadelphia Office of the Western Union Company, has been appointed Superintendent of the Sixth District of the Southern Division in place of Mr. D. H. Bates, resigned. This district extends from New York to Washington, along the coast, and also embraces a very large amount of inland territory. Mr. Merrihew has been in the service of the Western Union Company and its predecessors for many years at Philadelphia as operator, Assistant Manager and Manager, and brings to his new position a practical experience equaled only by few and excelled by none. It is an excellent appointment, and one which reflects as much credit on the Company as honor upon Mr. Merrihew.

## THE UNDERGROUND TELEGRAPH BILL.

The Committee on Cities of the New York House of Assembly, at Albany, gave a hearing, on Thursday, April 8th, on the bill to compel telegraph companies in cities to put their wires underground. Grosvenor P. Lowry, counsel, and George B. Prescott, electrician, appeared for the Western Union Company, Col. Lefferts for the Gold and Stock Quotation Company, and Mr. Grant for the District Telegraph. The arguments of these gentlemen were mainly devoted to showing that undertakings in the way of underground telegraphy had not worked satisfactorily. They claimed that even in London the plan of underground wires had developed serious defects, and that there are greater difficulties in the way of such a plan in New York than in London. In New York the amount of telegraphic business done in proportion to the area vastly exceeds that done in London. Mr. Prescott gave it as his opinion as an expert that a system of underground wires in New York would be almost, if not entirely, impracticable, on account of difficulties in insulation. Mr. Grant argued that to require the District Telegraph Company to put its wires under ground would ruin the Company. The chairman and some of the members of the committee were in favor of reporting the bill favorably, but the majority of the committee were opposed, and the matter was laid over until Tuesday, the 13th.

## BRITISH TELEGRAPHIC PROGRESS IN 1874.

The most important telegraphic improvements in the British system of Telegraphy, consist in the extended use of American inventions, that have been employed here for years. For example, *Engineering* says:

An important change has been effected during the year by the more complete adoption of the "Sonder." This is a step in the right direction, and the "Sonder" will eventually become the principal instrument in use by the department. Its introduction will be slow and gradual, but unquestionably its use will be found attended with the greatest success. The Duplex system has been found to answer admirably, and where business has increased to such an extent as to require extra accommodation, it has been at once introduced to the improvement of the working. On short circuits the ordinary Duplex system has been used, but in longer circuits the system known as "Stearns" has been adopted. At the present time the total mileage of wire working on the Duplex principle is over 12,000 miles, the largest circuit being 450 miles:

## THE TELEGRAPHIC ALPHABET IN SCHOOLS.

At a recent meeting of the Scottish Society of Arts, Edinburgh, Dr. Russell, Demonstrator of Anatomy to the University, read a paper on "The Telegraphic Alphabet as a branch of Technical Education in Primary Schools."

In the course of his remarks the lecturer explained the structure and uses of the Morse or telegraph alphabet, by means of a diagram, advocated its introduction into primary schools, and more especially into those situated along the coast. He then proceeded to mention some of the advantages possessed by the alphabet as a means of communication. Among these were its extreme simplicity and the ease with which it could be learned by very young children; that it helped to prepare for post office employment and a seafaring life; that it was already known all over the world by experts; and that it could be used with or without any apparatus—an advantage which the lecturer believed was not possessed by any other method of signaling; that it involved no expense; that it formed a good alphabet for the blind; that it developed the sense of time or rhythm; and was important in relation to lighthouses. Dr. Russell further stated that the Morse alphabet had been introduced with marked success into Kilmodan Free Church School and South Hall Public School.

## DESTRUCTION OF A TELEGRAPH LINE IN CHINA.

On January 22d a mob attacked the laborers on the telegraph line from Foo Choo to Amoy, at the town of Twang-Tao, and destroyed the poles, interrupting the work.

It is generally admitted that the attack was incited by the authorities, who have waited till the line reached a point where it would be at their mercy. No redress is possible, the work having been commenced in defiance of the wishes and without the full permission of the provincial government.

The Governor of Amoy has refused permission to lay a telegraph line between the town and the foreign settlement on Kulang Island, in the harbor.

## PROPOSED NEW TELEGRAPH COMPANY.

An Act of Incorporation has been passed by the Virginia Legislature chartering the Old Dominion Telegraph Company. The capital is to be \$500,000, in shares of \$50 each. The incorporators are Messrs. Frederick B. Hubbell, Edwin Fitzgerald, R. H. Logan, C. H. Smith, James D. Patten, D. S. Pollock and John A. McCaul.

The company is authorized to construct telegraph lines from any point on the waters of Chesapeake Bay and its tributary streams to any points within the State, and build all necessary branches. The Act passed the House on Friday, March 26th, and the Senate on Saturday, the 27th.

## THE GREAT EUROPEAN EXPOSITIONS.

The "Great Exhibition" of 1851, in London, remained open 141 days. The number of visitors was 6,039,192, and £424,322 was received for admissions. "Exposition Universelle" of 1855, at Paris, remained open 200 days, Sundays included. Number of visitors, 5,162,830, and £128,099 for admissions. "International Exposition" of 1872, in London, open 171 days, number of visitors, 8,505,969, and £420,735 for admissions. "Universal Exposi-

tion" of 1873, at Vienna, remained open 186 days, number of visitors, 6,740,200, and £206,478 for admissions. Total number of visitors at the five Expositions was 32,959,097, and £1,588,164 was received for admissions.

## GOVERNMENT TELEGRAPHING.

The taxpayers of the United States unconsciously possess a guarantee that the construction of Government telegraph lines will be in the highest degree inefficient and wasteful, and their administration defective and costly. The Chief Signal Officer has signalized his first effort in a business of which he is utterly ignorant, by making every possible blunder in the purchase of materials and the use of his stock. The Captain of the Fifth Cavalry, who was detailed to construct the 540 miles of military telegraph in Arizona, has reported to the quartermaster's department in effect that the Chief Signal Officer bought nearly 100 miles more of wire and a thousand more of brackets and insulators than were needed; that the cottonwood poles used will stand unrotted only from eighteen months to three years, according to the soil in which they are planted; that none of the poles will bear resetting; that the number of poles to the mile is too few; that a serviceable telegraph line must have at least twenty poles to the mile, each pole at least twenty feet long, and six by six at the butt and four by four at the tip; that the Chief Signal Officer's Arizona line has only seventeen poles to the mile, each only eighteen feet long; that he should have used No. 9 galvanized wire, but actually used No. 10 annealed; that a large portion of this wire was of inferior quality; that it easily broke under strain and when trying joints; and (we now quote from Cavalry Captain George F. Price's report) "a considerable portion of it was old, evidently having been used on other lines, taken down, repaired and coiled for sale, as opportunity presented, which opportunity appears to have shown itself in this line."

The vision of waste in Government telegraphing which this exhibit of ignorance and incapacity opens is simply blinding. The people, in advance of the complete establishment of the system, may as well make up their minds to pay three and four times as much for their telegraph service as they now do, if the United States Telegraph Department shall be self-sustaining. Their only escape will be an annual deficit in its accounts of millions of dollars—and this escape will be but seeming—for the deficiency will have to be met by taxation.

We have heretofore said that the Chief Signal Officer had succeeded in pushing the Government into the business of commercial and social telegraphy. Very few people know that in 1874 Congress passed an act authorizing the use of money "to be received for transmitting messages" over the line from Prescott to Camp Verde and Camp Apache in Arizona, to pay the expenses of operating and keeping the line in order. The Quartermaster-General's last report speaks with satisfaction of the income of this young line. He says: "The revenue derived from private messages and news reports has amounted to \$5,930.78, or an average of \$757.12 per month." It is a small beginning, way off in the desert and nearly out of sight, but it looms portentously. The policy and the law that are sufficient to authorize the Government to do the telegraphing of the country will certainly be found sufficient to make it run the railroads of the United States, and to do the package-carrying business of the existing express companies.—*N. Y. Sun.*



## ATMOSPHERIC ELECTRICITY AND OZONE.

We make the following extracts from an exceedingly interesting paper, by GEORGE M. BEARD, M. D., which was read before the "American Public Health Association," in New York, Nov. 13, 1873, and has recently been published in pamphlet form:

*How the subject of Atmospheric Electricity and Ozone has been Investigated.*—During the past quarter of a century regular, daily observations of atmospheric electricity have been made in Brussels, Munich, and for the past ten or fifteen years in St. Louis. The difficulties in the study of the subject are very great, but, from the accumulated observations of the different investigators, some few interesting and important general facts have been secured.

*Ozone-History.*—From the earliest recorded ages a peculiar odor has been observed during thunderstorms and other electrical disturbances, and especially in connection with flashes of lightning. The peculiar odor of thunder-bolts has been referred to by Homer, both in the "Iliad" and the "Odyssey." Jupiter is said to strike a ship with a thunder-bolt, "en de theiou pto," full of sulphurous odor, and to hurl a bolt into the ground "with the flame of burning sulphur." This peculiar sulphurous odor has been observed not only during thunder-storms, but also, it is said, during displays of northern and southern auroræ.

So long ago as 1785, Van Marum, of Holland, observed that electric sparks passed through oxygen gas (that had been discovered by Priestley only eleven years before) gave rise to peculiar sulphurous or electrical odor; and, at the beginning of the present century, Cavallo, a prominent name in the history of electricity, called attention to the fact that this "electrified air," as it was termed, had an antiseptic effect on decomposing matter, and was a salutary application for fetid ulcers. In 1826 Dr. John Davy, in a measure anticipating Schönbein, recognized this peculiarity of the atmosphere, and devised tests for detecting it.

The real scientific history of ozone dates from 1839, when Prof. Schönbein, of Basle, the renowned inventor of gun-cotton, observed that the electrolytic decomposition of water was attended by a peculiar odor resembling that evolved during the working of a frictional electric machine. In 1840 Schönbein called the attention of the scientific world to the newly discovered substance, to which he gave the name of *ozone*, from the Greek *ozoō*, to emit an odor. He showed that this odor appeared at the positive pole during the electrolysis of water. He furthermore pointed out that ozone may be produced by the slow oxidation of phosphorus in moist air or oxygen, and that the odor was similar to that which is observed during flashes of lightning. Schönbein studied hard on the subject for many years, and arrived at the conclusion that oxygen is capable of division into a negatively polar state, ozone, and a positively polar state, which he called *antiozone*. During the past quarter of a century the subject of ozone has been studied by some of the most eminent scientists of the age, among whom we may mention the names of Berzelius, De la Rive, Marignac, Becquerel, Faraday, Fremy, Meissner, Houzeau, Scutteten, Odling, Andrews, Tait, Fox, Fischer, Boeckel, Zeuger, Moffat, Nasse, Engler, Erdmann, Angus Smith, Poey, A. Mitchell, Soret, Baumert, Williamson, and very many others.

*Preparation of Ozone.*—Ozone is prepared in various ways—by passing electric sparks, or electricity without sparks, through oxygen or air, by the electrolysis of acidulated water, by oxidizing phospho-

rus in moist air, by the action of strong sulphuric acid (three parts) on permanganate of potash (two parts), by sending water in the form of spray through air, by introducing hot glass rods into vessels filled with the vapor of ether, and by the slow oxidation of ethers and oils, etc., when exposed to light.

*Properties of Ozone.*—Ozone is a colorless gas, with a powerful and peculiar odor. Like oxygen, it is an oxidizing agent of great power. It changes indigo into isatin, the black sulphate of lead into the white sulphate of lead. It oxidizes antimony, manganese, arsenic, iron, zinc, tin, silver, lead, bismuth and mercury. Many of the lower oxides it transforms into peroxides. It corrodes indiarubber and decolorizes blue litmus-paper. It acts with great rapidity on iodide of potassium, liberating the iodine. It quickly consumes ammonia, changing it into nitrate. It decomposes hydrochloric acid, liberating the chlorine. It is insoluble in acids, alkalis, alcohol, ether, the essential oils, and water. The odor of ozone is very penetrating; air containing but one-millionth of it is said to be perceptible to the olfactories. The peculiar odor of sea air is in part the result of ozone. All air, even the purest has more or less ozone; but so accustomed do we become to it that is only by sudden change into it that we perceive it. Visitors at the Mammoth Cave, Kentucky, report that, on emerging, the air has a peculiar and vivid odor, such as they never before realized. That we can in a half hour become so used to the foul air of a closed room that we do not perceive its odor until we leave it for a few moments and then return to it, is the experience of every one. The peculiar odor of ozone can be obtained very easily indeed by touching a metallic electrode of a galvanic battery of a number of cells against one of the plates of the batteries so as to make a connection of the current, or by touching the metallic ends of the poles for a moment with the spark thus produced.

*Ozone in the Atmosphere.*—Ozone, like electricity, exists normally in the atmosphere, but varies in amount in different localities at different seasons and in different hours of the day, and is considerably dependent on various meteorological conditions.

*Average Quantity of Ozone in the Atmosphere.*—The quantity of ozone in the atmosphere is exceedingly minute. The proportion varies with the locality, the season, the hour, etc., as we have already seen, and it also varies with the altitude, for it is with this agent as with electricity—it increases as we rise above the earth. According to Houzeau, air of the country, about six feet above the earth, contains about  $\frac{1}{1000000}$  of its weight of ozone, or  $\frac{1}{100000}$  of its volume. The quantity is so minute that it may probably be increased tenfold without perceptible injury to man or animal.

*Origin of Atmospheric Electricity and Ozone.*—The sources of ozone in the atmosphere are almost innumerable. Like atmospheric electricity, it results from a wide variety of countless and ever-changing influences: it is one of the grand resultants of the ceaseless chemistry of the earth and sky. The evidence is now pretty clear that one prominent source of atmospheric ozone is in vegetable life. The oxygen that plants evolve from their leaves is more or less ozonized. It is claimed that ozone is developed with the perfume of flowers. The most odorous flowers, as the heliotrope, hyacinth and mignonette, are the most prolific generators of ozone. This ozonic property of flowers is most manifest under the direct influence of sunlight. Lavender, fennel, mint, clove and cherry-laurel, evolve ozone with special abundance when exposed to the solar rays.

It is believed that the oxidation of essential oils, as aniseed, bergamot, etc., under exposure to the light and air, develops ozone, and that in all flowers the source of the ozone is the essence; hence it is that the most odorous are the most ozoniferous.

We are then to look for the sources of ozone, as of electricity, in all the infinite play of terrestrial powers: in the falling away of the rocks and the springing forth of plants; in the oxidation of metals and the emission of the perfume of flowers; in the deposition of dew, in the falling rain, the rattling hail, and the drifting snow; in the rushing of the wind and the conflict of the storm; in the friction of the clouds as they pass in the sky, or rest on the summits of the mountains; in the ceaseless evaporation on sea and on land; in the rushing torrents of the hills and the dashing breakers on the shore.

*Physiological Effects of Ozone.*—The physiological effects of ozone have been studied both on man and on animals. It is believed that the bracing and inspiring effect of a clear, crisp and sparkling morning is due in part to the great amount of ozone in the atmosphere. When it is held in combination with oxygen or common air, it acts much like oxygen, but more powerfully. It affects the pulse, the respiration and circulation in various ways, according to the quantity taken and the temperament of the individual. In this respect it behaves like electricity. It has been thought that ozone is formed in the body from the contact of oxygen gas with the blood, and there are those who believe that it is absorbed with the ozone in the air and is carried into the blood, where it takes part in the process of oxidation.

ON THE ACTIONS PRODUCED BY THE SIMULTANEOUS MEETING OF BATTERY AND OF ELECTRO-CAPILLARY CURRENTS.—By M. Becquerel.—M. Becquerel inquiring if it were possible to increase or diminish the intensity of electro-capillary actions by making use of the current of a battery of several elements, used two apparatus. The first was a cracked tube containing a metallic solution, and immersed into an epruvette with an alkaline solution; the second was a pervious partition apparatus—a tube closed at bottom by a piece of parchment paper and containing a metallic solution. This latter was plunged into an epruvette containing an alkaline solution. The electro-capillary action was increased by means of two plates of platinum in connection with a battery; the positive plate being immersed into the metallic solution and the negative plate into the alkaline. The resultant electro-chemical actions were very different according to the nature of the solutions experimented upon. Copper and lead were reduced to the metallic state; silver, bismuth and iron were hydrated with the alkaline; whilst gold and zinc gave no deposit. Wherefore these differences? They result undoubtedly from two existing currents, the lateral and central. The former tends to conduct metals in the metallic state to the negative surface of the pervious tissue, viz., the parchment paper, and at the same time the alkaline and the oxygen are transported to the positive plate. The elements meet on the negative surface, and the effects produced depend upon the affinities of these different substances; thus, if sulphur has a great affinity for the metal a sulphate will be produced. This takes place, as before stated, with silver, bismuth and iron; but, if the reductive property of the current gets the better of the affinity of the metal for sulphur, a metallic reduction ensues, such as takes place with copper and lead.

**NEW CONDITIONS FOR THE PRODUCTION OF THE ELECTRIC EFFLUVE, AND ITS INFLUENCE UPON CHEMICAL REACTIONS.**—*M. A. Boillot.*—The author, in continuing his researches on the nature of ozone, and on the reactions produced by the electric effluve by means of the apparatus described in previous communications, has been led to operate under the following novel conditions:—Instead of forcing the gas to pass between tubes forming a very narrow annular cylindrical space, traversed by the effluve, he wished to ascertain what would happen on experimenting with the same source of electricity in a much larger space. To this end he took a first tube of glass, 36 centimetres long and 1 m.m. in internal diameter, and filled it with graphite reduced to a fine powder. One of its ends was closed at the lamp, and to the other end was sealed a platinum wire communicating with the graphite. This small tube was placed in the center of a tube of medium size, of 9 m.m. internal diameter, so that there was an interval of at least 3 m.m. between the sides of the two tubes in the entire length of the annular cylindrical space which they formed. Into this space the gases were to penetrate, and there undergo the action of the effluve, being in contact merely with the sides of the tubes. The above combination of tubes was fixed in a third and larger tube of the same length as the former, the annular space being here also filled up with powdered graphite. The two rings of carbon at the ends of the large (outer) tube were then stoppered with shellac, a platinum wire being fixed in one of the rings so as to communicate with the carbon in the large tube at the opposite end to the platinum wire in the inner tube. From this latter side the gas enters into the space left between the small and the medium tube, which is prolonged at the other end, and re-curved over the trough where the gas has collected which has undergone the action of the electricity. This electricity is produced by connecting the platinum wires of the apparatus with the electrodes of an induction coil working with two, three, four, or five moderate sized Bunsen elements. In these conditions, and under the action of so feeble an electric tension, the effluve acts upon the gaseous current experimented upon. Both with atmospheric air and with oxygen ozone was produced in proportions not less than with the author's other apparatus.

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### DIVIDEND No. 32.

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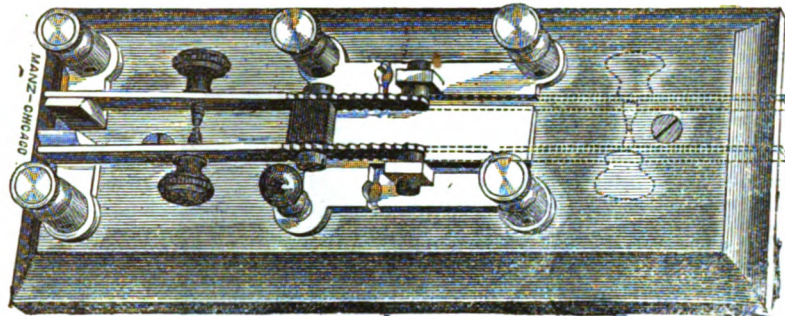
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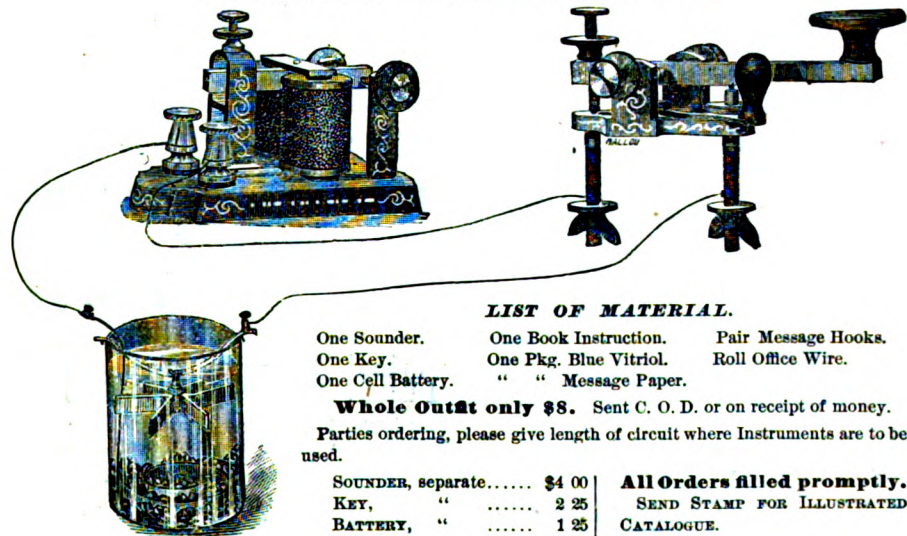
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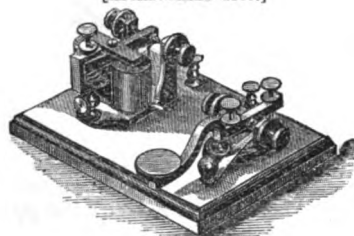
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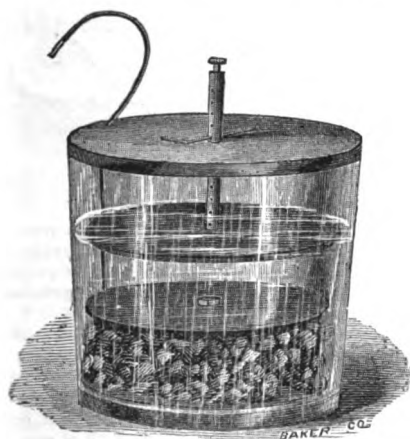


\$11.50.

MANUFACTURER OF

Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

## BLISS' RESERVOIR BATTERY.



Price per Cell \$2.

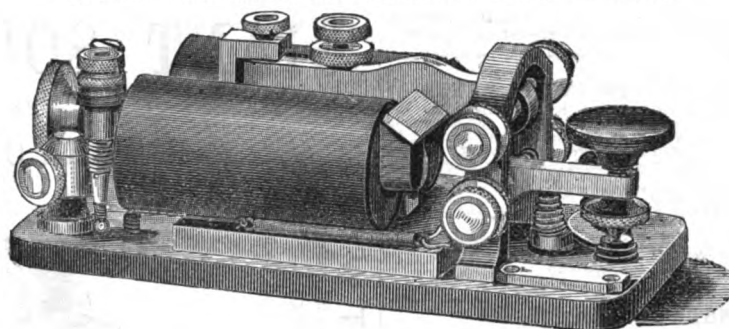
It will run as a local battery for six months without attention, and as a main battery for a longer period.

**GEO. H. BLISS & CO.,**

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## Bunnell's Little Giant Main Line Sounders, THE PERFECTION OF MAIN-LINE SOUNDING RELAYS.



[BUNNELL'S LITTLE GIANT POCKET RELAY.]

In the form of Pocket Relays as shown above, or WRECKING SETS, larger size, same style, or for use on Main Line in offices without Locals, these splendid instruments are, in all practical respects and in external beauty, as near absolute perfection as can be desired.

They are very compact, but the working parts are all of full size.

They give out a very clear, distinct stroke, nearly as loud as that of a good Local Sounder.

The adjustments are peculiarly convenient. All parts are perfectly made, highly finished, and mounted upon *Polished Hard Rubber Bases*.

As this form is so entirely new, and so far superior to any others hitherto made, it should be seen by all Superintendents, and tried on

**EVERY RAILWAY TELEGRAPH LINE,**

with a view to its adoption as the

**STANDARD INSTRUMENT FOR WRECKING SETS AND OFFICE PURPOSES.**

[Messrs. L. G. Tillotson & Co. are the only parties authorized by me to manufacture these instruments.]

JESSE H. BUNNELL.]

<b>PRICES—Pocket Relay in case.....</b>	<b>\$22 00</b>
<b>Larger Size, for Office or Wrecking Uses, on Hard Rubber Base, with Key on Base,.....</b>	<b>24 00</b>
<b>Without Key.....</b>	<b>20 00</b>

Subject to our 20 per cent. discount on all orders accompanied by cash or money order.

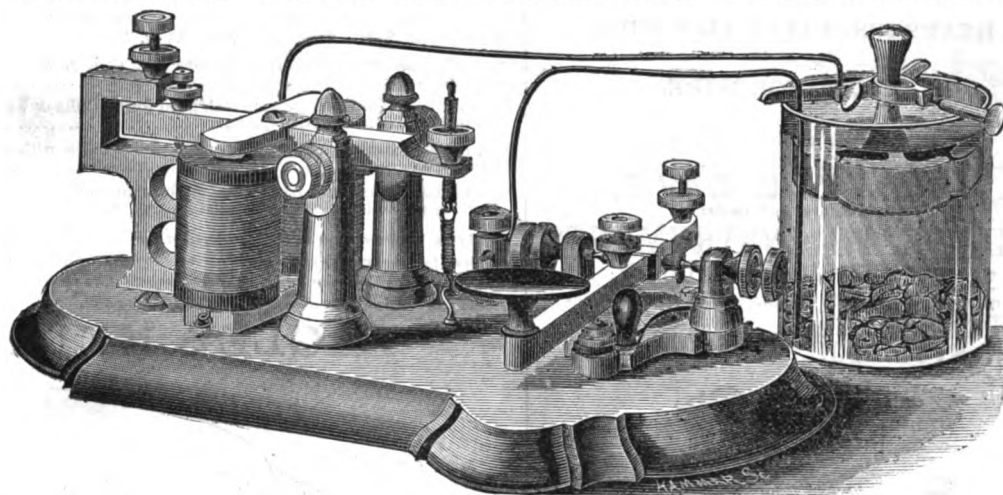
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**DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.**

## BUNNELL'S CHAMPION LEARNER'S INSTRUMENTS.



**Complete and Perfect Full-Sized Sounder and Key combined, with Book of Instruction Battery, Wire, and all necessary materials.**

[Since my invention and introduction of these instruments, less than a year and a half since, two thousand sets have been sold and put in operation throughout the country, giving the most perfect satisfaction everywhere. They will hereafter be manufactured by Messrs. L. G. Tillotson & Co. JESSE H. BUNNELL.]

THESE SETS ARE MADE IN THE BEST MANNER, and are just exactly the thing wanted for Learners' uses, for Telegraph Schools, or for Short Lines from a few feet to twelve miles long.

Price, complete, with Battery, Book of Instructions, Wire, and all necessary material to put in operation.

<b>Singly, or on a Short Line.....</b>	<b>\$8.50</b>
<b>Champion Learner's Instrument, without Battery, &amp;c.....</b>	<b>6.50</b>
<b>Ornamental "Instrument" with Rubber-covered Coils, &amp;c.....</b>	<b>7.50</b>

Same instruments, wound with fine Silk-covered Wire, so as to work well on lines up to twelve miles in length, \$1.00 in addition to above rates.

These prices are subject to our usual discount of 20 per cent. where money is sent in advance, either by postal order or draft.

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**DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.**



**A SUPERIOR  
PRINTING TELEGRAPH INSTRUMENT,  
FOR PRIVATE AND SHORT LINES,**

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1873.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. E. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is SIMPLE, RELIABLE, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

**PRIVATE LINES** constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employees, &c., for the introduction of the Printer. For further particulars, terms, &c., apply to

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INSTRUMENT AND OFFICE WIRES

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HEAVY INSULATED LINE WIRE

RESISTANCE WIRE.

Wires of every variety of Insulation

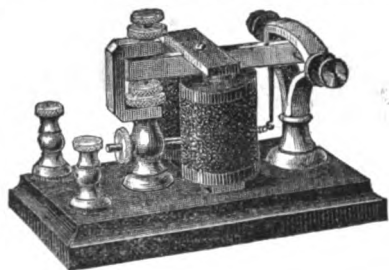
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Manufacturer and Dealer in

**TELEGRAPH INSTRUMENTS,**

341 Newark Avenue, Jersey City, N. J.

Now offers for sale, or will manufacture to order all kinds of Telegraph Material.

**NEW STYLE SOUNDER—"STENTOR."**



Price \$5.00.

**COPPER  
OFFICE AND MAGNET WIRE,  
BRAIDED AND WOUND,  
SINGLE and DOUBLE, with COTTON,  
LINEN, SILK;  
Paraffined or Varnished, Compressed and Polished.  
Manufactured and for Sale by  
WESTERN ELECTRIC MANUFACTURING CO  
CHICAGO.**

**OFFICE & MAGNET WIRE,  
BRAIDED AND WOUND, SINGLE and DOUBLE,  
with COTTON, LINEN, SILK;  
Paraffined or Varnished, Compressed and Polished.**

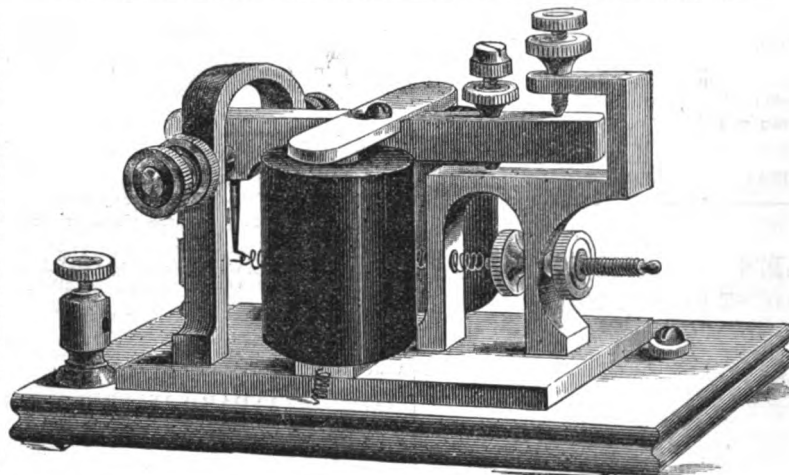
**PARTRICK & CARTER,**

The only Manufacturers of the Original

**GIANT SOUNDER PERFECTED.**

PATENTED FEBRUARY 16, 1875.

**BEWARE OF WORTHLESS IMITATIONS.**



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every instrument warranted perfect.

**PRICE, SENT C. O. D., \$7.50,**

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

**CHAMPION LEARNERS' INSTRUMENTS.**

**THE BEST OUT.**

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

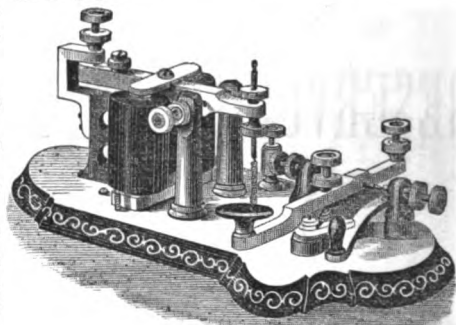
Price of single instrument, good for one mile or less, without Battery, &c. \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7 50

Price of single instrument, good for one to twelve miles, without Battery, &c. 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8 50

This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.



**EAGLE'S METALLIC BATTERY.**

THE EAGLES METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

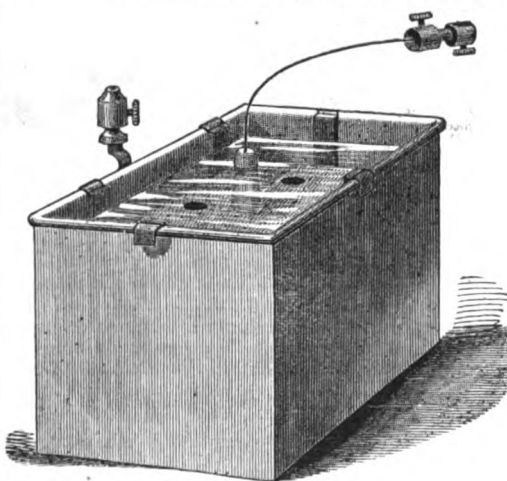
Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

For OPEN CIRCUITS, where all other gravity batteries are acknowledged failures, the Eagles Battery is found to be, in every respect, a PERFECT SUCCESS.

**PRICES:**

No. 1, Square Cell, complete, - \$2.25  
No. 2, Round " " - 2.00



**PARTRICK & CARTER, Sole Agents,**

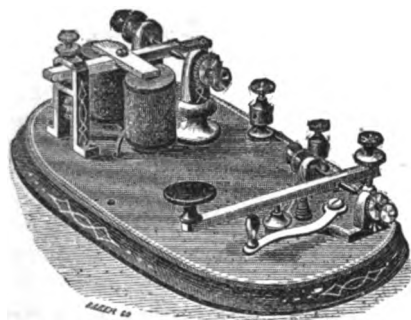
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## Private Line Instrument



Price. \$8.

This Instrument is well finished, and gives a clear, loud sound. It is made to work on a line from a few feet to ten miles long. In ordering, give length of line, size of wire, and number and kind of Instruments in the same circuit.

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TELEGRAPH ENGINEER,

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Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their business, domestic and foreign, enabling them to keep pace with telegraphic progress.

They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

F. L. POPE &amp; CO.,

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Telegraph Instruments and Supplies,

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STANDARD TELEGRAPH INSTRUMENTS,

RELAYS SOUNDERS, REGISTERS

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INSULATED WIRES,

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THE NONPAREIL TELEGRAPH INSTRUMENT for amateurs, learners and short lines.

Over 3,000 of them have been sold, and the demand for them continues unabated.

Globe Lightning Arresters,

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Also, Agents for Hochhausen's Superior Low-Priced Telegraph Instruments.

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Eagles Metallic Galvanic Battery.

The demand for this Battery is rapidly increasing, and it is conceded by all who have used it to be the *Best and most Economical* Battery, for telegraphic and other purposes, offered to the public.

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HAVING REMOVED OUR PLACE OF BUSINESS TO

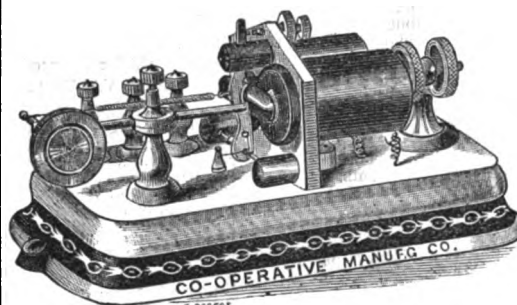
No. 218 PEAR STREET,

where we have increased facilities for manufacturing, so that we now can promptly fill all orders on short notice; and our starting motto will be fully maintained, which is, "All work done in a workmanlike manner and of the very best material, which will not fail to gain the confidence of all and give entire satisfaction to the purchaser," as we started on the above principle and have numerous letters of recommendation which fully certify to the fact.

And we would particularly call the attention of Telegraph Superintendents and Purchasing Agents that, before purchasing elsewhere, they send for a sample of our work, and we will forward at our own expense, so that they can give all our instruments a fair trial; and if not what we represent them to be, they can be returned, as we would like to have them compared with those of other makers.

Our Relays, Keys, Sounders and Switches have all the modern improvements, and we will manufacture to order any style or design of instruments, or of any number of Ohms or Units Resistance that patrons may wish. Thanking our numerous patrons for past favors, we respectfully solicit the continuance of the same.

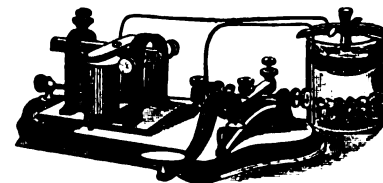
WM. R. BALDWIN, Manager.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. Is finely finished.

Price, - - - - \$16.



Co-operator's Learner's Instrument.

A complete outfit, embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practicing or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined. The instructions are clear and practical, and contain all information necessary for the student. All technical terms and expressions are avoided, as they only perplex and make the road to knowledge more difficult.

Learners' Instrument complete, \$9.50  
without Battery, \$8.00.

No. 2 Learner's \$5, with Battery, \$6.50.

Sent by Express, C. O. D., or upon receipt of money order.

SEND FOR PRICE LIST.

W. R. BALDWIN, Manager, 218 Pear St., Phila.

## AN IMMENSE VARIETY

OF

## Telegraph Instruments

## BATTERIES AND SUPPLIES,

To suit every possible purpose, at Lower Prices than the same quality of goods are offered elsewhere in America.

L. G. TILLOTSON &amp; CO.,

New York and Philadelphia.

Our list comprises not only every description of FIRST-CLASS TELEGRAPHIC APPARATUS, but a full stock of every variety of SHORT LINE and AMATEURS' INSTRUMENTS, for the use of Schools, Learners, City Lines, &c., and the greatest assortment of

## TELEGRAPH MATERIALS, WIRE BATTERIES AND SUPPLIES

To be found in any one American establishment.

Managers, Operators, and all others acting as Agents for the sale of LEARNERS' INSTRUMENTS, SOUNDERS, KEYS, &c., will please take notice that we are now manufacturing, and will sell at our regular 20 PER CENT DISCOUNT, on cash orders, all of BUNNELL'S POPULAR SPECIALTIES, known as

THE GIANT SOUNDER,

CHAMPION SOUNDERS,

CHAMPION LEARNERS' INSTRUMENTS,

CHAMPION KEYS, &amp;c.

These excellent working and very low-priced Instruments, together with our well-known

Excelsior Apparatus, Cheap Relays for Short Main Wires, numerous forms of Keys, Switches, Batteries, &c.,

all go to make up a complete list of EVERYTHING REQUIRED BY AGENTS to enable them to supply all demands of any kind.

We solicit correspondence from Managers and Operators in every locality, confidently assuring them that we are prepared to offer them selections from a MORE COMPLETE STOCK, at MORE FAVORABLE DISCOUNTS, than have yet been obtained in any quarter.

Remember that L. G. TILLOTSON & CO. keep everything wanted for Telegraphy, give the most Liberal Discounts, and their MACHINERY IS THE VERY BEST THAT CAN BE PRODUCED.

GENERAL DEPOTS:

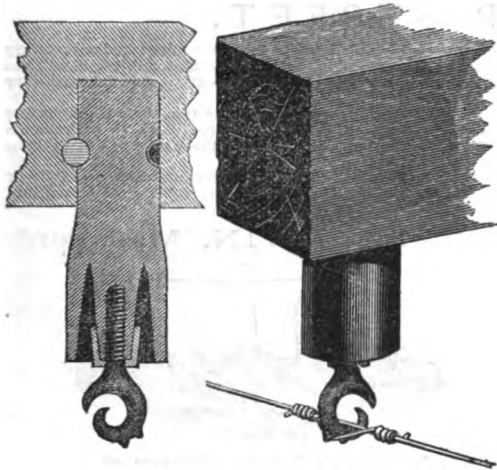
8 Dey Street, New York,

54 S. Fourth Street, Philadelphia.

# THE KENOSHA INSULATOR CO.

## TELEGRAPH COMPANIES and TELEGRAPH CONSTRUCTORS

are invited to examine the merits of our new and improved patterns of



### KENOSHA CARBON INSULATORS!

These insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellent of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of Six YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its *insulating qualities* are, on an average,

MORE THAN TEN TIMES AS GREAT

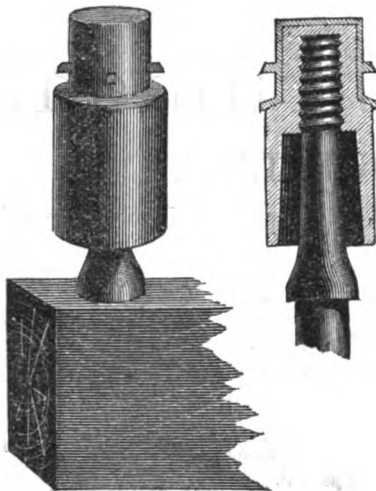
during the prevalence of rain or fog.

Immense numbers of these insulators are in use by

**The North Western Telegraph Co.,  
The Western Union Telegraph Co.,**  
as well as many RAILWAY and OTHER TELEGRAPH LINES, and they have invariably been found to give

### ENTIRE SATISFACTION.

Besides the suspension insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, and which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



### CAP INSULATOR, WITH PIN OR BRACKET,

which is fitted with a zinc protection, as shown in the above figure.

### THE KENOSHA INSULATOR

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and *not a single imperfect one is allowed to leave the factory.*

We are also prepared to furnish, at short notice,

**CROSS-ARMS for any REQUIRED NUMBER OF WIRES,** prepared with our patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all insulators furnished by us to prove entirely satisfactory.

**THE KENOSHA INSULATOR CO.,**

KENOSHA, WIS.

**L. G. TILLOTSON & CO.,**

8 Dey Street, New York,

GENERAL EASTERN AGENTS,

## AMERICAN FIRE ALARM

AND

POLICE TELEGRAPH.

GAMEWELL & CO., PROPRIETORS,

NO. 62 BROADWAY, NEW YORK.

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ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,

San Francisco, Cal., Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

### AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM RELIABILITY:

Albany, N. Y.,  
Allegheny, Pa.  
Boston, Mass.  
Buffalo, N. Y.  
Baltimore, Md.,  
Chicago, Ill.  
Cincinnati, Ohio,  
Columbus, Ohio,  
Cambridge, Mass.,  
Charlestown, Mass.,  
Covington, Ky.,  
Detroit, Mich.,  
Dayton, Ohio,  
Elizabeth, N. J.,  
Fall River, Mass.,  
Fitchburg, Mass.,  
Hartford, Conn.,  
Jersey City, N. J.,  
Louisville, Ky.,  
Lawrence, Mass.,  
Mobile, Ala.,  
Montreal, Canada,  
Milwaukee, Wis.,  
New York City,  
Lynn, Mass.,  
Lowell, Mass.,

New Orleans, La.,  
New Haven, Conn.,  
Newark, N. J.,  
Omaha, Neb.,  
Philadelphia, Pa.,  
Pittsburg, Pa.,  
Portland, Me.,  
Peoria, Ill.,  
Providence, R. I.,  
Quebec, L. I.,  
Rochester, N. Y.,  
Richmond, Va.,  
Indianapolis, Ind.,  
St. Louis, Mo.,  
St. John, N. B.,  
Springfield, Mass.,  
San Francisco, Cal.,  
Savannah, Ga.,  
Syracuse, N. Y.,  
Troy, N. Y.,  
Toledo, Ohio,  
Toronto, Canada,  
Washington, D. C.,  
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New Bedford, Mass.,  
Bridgeport, Conn.,

The distinctive features of these systems of

## FIRE ALARM AND POLICE TELEGRAPHS

ARE,

*First*—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables any one—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without the constant personal attention of either operators or watchmen.

*Third*—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

*Fourth*—The ELECTRO-MECHANICAL GONG STRIKER, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

*These features combined form the*

ONLY PERFECT, COMPLETE, AND RELIABLE SYSTEM

OF

### FIRE ALARM TELEGRAPH IN THE WORLD.

Messrs. GAMEWELL & CO. are the owners of the original *FARMER AND CHANNING PATENTS*, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or effort to secure improvements, and the systems are now covered by

### MORE THAN TWENTY PATENTS.

The introduction and operation of the

### AUTOMATIC SYSTEM

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

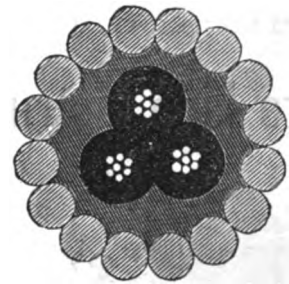
*The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.*

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraph upon application as above.

## THE BISHOP GUTTA PERCHA WORKS.

422, 424, 426 East 25th St., N. Y.



## S. BISHOP

PROPRIETOR,

ONLY AMERICAN MANUFACTURER

OF

PURE GUTTA PERCHA GOODS

IN THE

UNITED STATES.

Have on hand and made to order

SUBMARINE TELEGRAPH CABLES,

INSULATED WIRES, for

TELEGRAPH AND ELECTRIC USE, and for

BLASTING AND MINING PURPOSES,

in every variety desired.

As an Insulation for Telegraph Cables and Electric Conductors GUTTA PERCHA has been universally adopted by all scientific and practical Electricians and Manufacturers of Telegraph Cables and Wires in this country and Europe, and has sustained, with increasing confidence in its superiority, the practical test of over twenty years' general use.

The PROPRIETOR would say to all parties desiring

SUBMARINE TELEGRAPH CABLES,

that he will guarantee to make and deliver at his Factory any style of Cable, Insulated with Gutta Percha, as low as they can import Cable of the same style and quality.

ORDERS RECEIVED AT THE FACTORY.

Messrs. L. G. TILLOTSON & CO.

8 Dey Street, New York,

54 South 4th St., Philadelphia

22 West 4th St., Cincinnati,

have been appointed by me GENERAL AGENTS for the sale of any Telegraph Cable or Wire manufactured at the Works in New York, at Factory Prices, delivered in New York.

JOHN THORNLEY, 503 Chestnut St., Philadelphia

has been appointed Agent for the sale of any and all goods manufactured by me, at Factory Prices, delivered in New York.

Any goods of my manufacture (except Telegraph Goods), are for sale in New York, by

H. G. NORTON & CO., 26 Park Place

RUBBER CLOTHING CO., 363 Broadway,

D. HODGMAN, 27 Maiden Lane,

SHEPARD & DUDLEY, 150 William St.

Address all communications to S. BISHOP,

OFFICE AT FACTORY.

John Polhemus, Printer, 102 Nassau, cor. of Ann Street.

# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 9.

NEW YORK, MAY 1, 1875.

WHOLE NO. 180.

## GALVANISM.

**GALVANISM**, or Voltaic Electricity, is the branch of the science of electricity which treats of the electric currents arising from chemical action, more particularly from that attending the dissolution of metals. It is sometimes called dynamical electricity, because it deals with current electricity, or electricity in motion, and is thus distinguished from frictional electricity, which is called statical, in consequence of its investigating the electrical condition of bodies in which electricity remains insulated or stationary. These terms, although in the main thus properly applied, are in all strictness applicable to both sciences. Frictional electricity, though small in quantity, can pass in a sensible current, and galvanic electricity, though small in tension, can be made to manifest the attractions and repulsions of statical electricity. Thus the series of discharges which are transmitted in a wire connecting the prime conductor of a machine in action with the ground or negative conductor, possesses, though feebly, the characteristics of a galvanic current; and the insulated poles of a many-celled galvanic battery manifest, before the current begins, the electric tension of the friction machine.

The observations made in 1789, by Galvani, that the legs of a dead frog are convulsed when their muscles are connected with a strip of copper, their nerves with a strip of zinc, and the opposite end of the two strips are united, convinced Volta, after a great deal of experimental investigation, that these phenomena were due to electrical action. The result of Volta's researches established the fact that when two dissimilar metals come into contact, they become electric, and the force of the electrical commotion depends upon the nature of the metals. This force acting on the point of contact of dissimilar metals is called electromotive force. It divides the electricities present in the natural condition of the metals, and forces from the point of contact the + fluid in one of the bodies, and the - fluid in the other, where they remain in a state of rest and tension, in an effort to unite again, until finally they find some means of coalition and equalization. All the metals as well as the carbons are good electrometers, but no two metals develop in connection with any other the same degree of electrical tension. Zinc, for instance, in contact with platinum, becomes more electric than when in contact with copper; and copper in contact with platinum becomes + electric, while in contact with zinc it becomes - electric. The following series of bodies is so arranged that any of them in contact with some other becomes electric, and each preceding body in this series in contact with the succeeding body is + electric, while the succeeding body is - electric: + zinc, lead, tin, iron, copper, silver, gold, platinum, carbon -

## GALVANIC CURRENT.

When in Fig. 1 the zinc plate *a b* comes in contact with the copper plate *a c*, the + E of both metals gather on the zinc plate, and - E on the copper plate.

[Both electricities are in a state of tension or of desire to unite again, which, however, they are not able to do, owing to the source of commotion (the

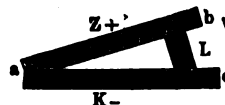


Fig. 1.

contact place *a*) to take the lead. Now, if we connect the zinc and the copper plate by means of a moist conductor *L*, for example, by means of a strip

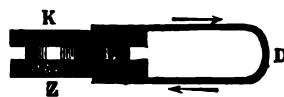


Fig. 2.

of pasteboard soaked in water, or in diluted sulphuric acid, or if we dip both contiguous plates in such a fluid, the union of both separated electricities



Fig. 3.

takes place through this moist conductor, the + E flows from the zinc through the conductor in the direction of the arrow towards the - E of the cop-

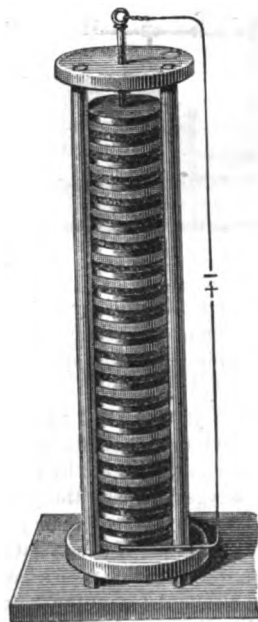


Fig. 4.

per, the - E of the copper on the contrary in the opposite direction towards the + E of the zinc, and the electric flow would at once cease were it not

that in the continuing contact of the metals a source of an ever new analysis of electricity were to be found. At the same moment that both electricities pass through the moist conductor and become equalized, the electromotive force produces on the point of contact *a*, a new electric analysis, which likewise, however, becomes at once equalized again, to make room for a new tension.

In this apparatus, which is styled an *open voltaic* or *galvanic circuit* as long as there is no moist conductor, and a closed voltaic or galvanic circuit or a single galvanic element as soon as the moist conductor is put in, a continuous flow of both opposite electricities takes place in opposite direction. The flow of the + E proceeds from the zinc through the fluid to the copper; outside of the fluid it passes from the copper over the contact point to the zinc. This uninterrupted equalization of both electricities forms a continuous flow, which is styled a *galvanic current*. When we speak of the direction of a galvanic current, we always mean the direction of the + electricity in motion for the time being which follows outside of the fluid from the copper to the zinc.

In order to become convinced of the presence of a specific electrical action when two different metals come in contact, we may place a strip of zinc under the tongue, a piece of silver or copper on the tongue, and then put both pieces outside of the tongue in contact, and we shall instantly perceive a peculiar taste which we have not discovered previous to the metals coming in contact; or we may put the strip of zinc between the lower eyelid, this previously being somewhat moistened, and squeeze the strips of copper between the upper lips and the gums, and at the moment that both metals are brought into contact we shall perceive a weak ray of light in front of our eyes.

The most simple form of a closed voltaic circuit is represented in Fig. 2, in which *Z* is the zinc plate, *K* the copper plate, *L* the moist conductor, and *D* a copper wire connecting *Z* and *K*, styled the closing wire.

When we replace the moist disk by a fluid, the element takes the form of Fig. 3, where *Zk* represents the plate of zinc, and *Cu* the copper. The galvanic current or the motion of the + E follows in both cases in the direction of the arrow, to wit, outside of the fluid from copper to zinc.

## THE VOLTAIC BATTERY—GALVANIC BATTERIES.

If, as is represented in Fig. 4, several compound pairs of zinc and copper plates are put up in layers, always in the same order, and between each pair a moist conductor is inserted, such as a disk of felt, cloth or pasteboard, so that the succession of the bodies arranged on each other from top to bottom is as follows:

Copper, zinc, conductor | copper, zinc, conductor  
Copper, zinc, conductor | copper, zinc, conductor  
as one end of the series terminates with zinc, and the other end begins with copper, when both ends are connected by a wire, the more pairs of plates the series contain the greater will be the current. The



extreme ends of the series are called poles. The pasteboard disks are soaked in water, mixed with common salt or sulphuric acid, and thus allow an easier passage to the current than when they are moistened with pure water.

Where a fluid is used instead of a moist disk, the battery has the form represented in Fig. 5. In each glass is a zinc and a copper plate, and each zinc plate of one of the vessels is connected by a copper wire with the copper plate of the preceding vessel. The poles of the battery indicated by + and - are both connected with closing wires. As is represented in the drawing by arrows, inside the cells the positive current passes from zinc to copper and externally—that is to say, in the closing wire, from copper to zinc.

As electricity is also created through the contact of a metal with a fluid, the action of a voltaic battery will be plainly understood when it is granted that the seat of the force which creates the electricity is not only to be found in the contact points of both metals, but in the contact between the metal and the fluid; hence some electricians have recently so enlarged upon Volta's theories in this respect as to admit, besides the creation of electricity through the contact of metals, still another similar force at the contact point of the metals and the fluids. Opposed to these we find the advocates of the chemical theory, who contend that electricity in a galvanic element is created only when a chemical action takes place between the fluids and the metals. In truth, both contact between dissimilar substances and chemical action are necessary to produce voltaic electricity. The laws regulating the potential and those regulating the current are intimately connected with the nature of the substances in contact, and with the amount of the chemical action. Perhaps it is strictly accurate to say that difference of potential is produced by contact, and that the current which is maintained by it is produced by chemical action. In cases where no known chemical action occurs, as where copper and zinc touch one another, the difference of potential is produced, and since this involves a redistribution of electricity, a small but definite consumption of energy must then occur; the source of this power cannot yet be said to be known.

If both poles of a galvanic battery are connected through a conducting wire, the latter shows a succession of phenomena, which may conveniently be arranged in five classes, to wit: 1. The phenomena of light; 2. The production of heat; 3. Physiological effects; 4. Chemical, and 5, Magnetic effects.

The phenomena of light are perceptible even with a single galvanic element of large surface. If the extreme ends of the wires starting from the poles are brought together, as in Fig. 4, we perceive, when separated, a beautiful bright spark if the ends have been previously amalgamated. If we take for this experiment a battery of 40 or 50 elements and put coke points on the extreme ends of the wires, there will appear between the coke points a splendid electric coal light, whose dazzling brilliancy blinds the eye. It is deserving of notice that, whilst frictional electricity has such an enormous tension that, under favorable circumstances, sparks will leap across the air to neighboring conductors, at a

distance of 40 inches, we may place the poles of a very powerful galvanic battery to within  $\frac{1}{1000}$  of an inch of each other without any spark passing over or the battery sending any current. The ordinary galvanic battery is, therefore, unlike the electric machine and the Leyden Jar Battery in respect to tension.

The production of heat by the galvanic current is likewise apparent, even in a single element of large surface, where a fine platina wire inserted in the closing wire becomes red hot. By means of a series of these elements, or a voltaic battery, this metal is easily melted.

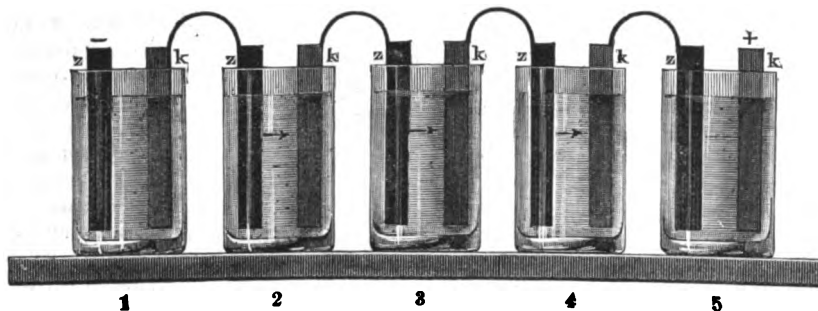


Fig. 5.

The physiological actions of the galvanic current are manifested even by a single element in affecting the taste and the optic nerves. They appear in a far greater degree when the terminal wires of a powerful galvanic battery are seized by moist hands, causing an almost intolerable sensation, and burning in the arms and the breast. Upon this fact are founded also the highly interesting experiments which are often made with galvanic currents on recently killed animals and human beings.

#### THE CHEMICAL ACTIONS

of the galvanic current are, in theoretical and practical relations, incomparably more important than those we have dealt with heretofore, in so far as on the one hand they give the particulars of the nature and the origin of the current, as well as of the con-

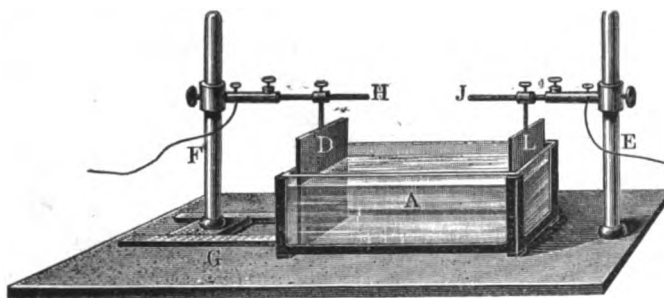


Fig. 6.

struction of the now customary galvanic elements, and on the other hand are frequently used in electroplating, electrotyping and gilding, and also in telegraphy.

When, as in L in Figs. 1, 2 and 3, a part of the conductor consists of water, its materials, oxygen and hydrogen, become analyzed by the action of the current. The oxygen attacks the zinc Z (the positive metal) and forms oxide of zinc; the hydrogen accumulates on the copper K (the negative metal) and in a short time covers the plate with a gas atmosphere. All the oxygen accumulates on the zinc, and all the hydrogen on the other metal. The same holds good also when, as is shown in next Fig. 6, the current outside the battery passes through a fluid. If, for instance, the positive current enters through the

closing wire E to plate L, made of zinc, platina, or some other metal, into the water A, and out again through the metallic plate D, then the oxygen accumulates at L, and at D the hydrogen.

Hence it follows that, without regard to the peculiar electromotive power of the hydrogen against the copper, the metallic surfaces of the zinc and the copper in short become separated from the conducting fluid, and instead of the former pure metallic contact of the fluid and of the plates, now a contact of oxide of zinc and hydrogen with the conducting fluid sets in. Hence the original current very soon loses its strength and has almost disappeared after a short time. The same takes place to a greater extent in the ordinary voltaic battery, because, owing to the more active analysis of the water which the stronger current produces, the oxygen unites with the zinc to produce oxide of zinc, and the hydrogen in the form of small bubbles, covers the copper; hence, instead of the original zinc-copper battery, we now have a combination of far weaker electromotors—zinc-hydrogen is produced.

If we put in a vessel A, containing acidulated water (Fig. 6), two platina plates, D L, and connect them with the pole wires F E of a voltaic battery, or any other galvanic battery, the water between the platina plates becomes likewise decomposed; the oxygen is carried to the positive, the hydrogen to the negative platina plate. As the oxygen here does not unite with the platina, both gases, the mixture of which is styled inflammable gas, rise at the platina plate from the fluid. Several other compound bodies like water, are decomposed by the galvanic current, and in this capability of the liquid conductor of being decomposed, the principal reason is to be found for the unsteadiness of the earlier voltaic batteries.

**EFFECT PRODUCED BY THE APPLICATION OF ARMATURES TO MAGNETS.**—*M. J. Jamin*—The author has already indicated (*Comptes Rendus*, lxxviii., p. 1331) the procedure which enables him to calculate the total magnetism of a magnet. He employs magnets, the thickness and width of which are equal respectively to 10 and 50 millimetres; their lengths vary. The armatures are of the same width and thickness; they are adjusted as accurately as possible, and secured by pressure on the extremities of the magnet which they prolong. If a single armature is placed at the northern end of a magnet, it in no wise modifies the magnetic condition of the

southern end, which remains bare. If the effect produced on the south side by the application of an armature is considered, it will be found that it takes magnetism which the steel loses, but that this new distribution is no wise modified by putting an armature on the opposite side, or by removing one. Hence, as regards armatures, there is an absolute independence between the two halves of the magnet. This independence proves a capital fact: that the application of an armature to one of the ends of the magnet occasions a new distribution there, but neither decreases nor augments the sum total of the magnetism there present; the steel loses what the armature gains. This points out a method of determining the magnetism of steel as compared with that of soft iron.

## THE SOCIETY OF TELEGRAPH ENGINEERS.

An ordinary meeting was held on Wednesday, the 24th of February, Mr. Latimer Clark, President, in the chair. A paper by Mr. R. S. Culley was read, *On the Induction Between Suspended Wires as Affecting Automatic Transmission.*

A well-insulated line of telegraph was erected, in 1871, from London to Holyhead, in connection with a new submarine cable to Ireland. The wires went from the central station to Paddington, underground, thence on the Great Western Railway to Chester, where they proceeded by rail to the cable hut near Holyhead. The sections were:

	Miles.	Yards.
Underground.....	10	1648
Road.....	75	833
Railway.....	216	1457
Total.....	301	3938

From Paddington to Chester the wires were of No. 4 gauge, then of No. 8 B. W. G.

Several of these wires were worked automatically at high speeds, and a considerable disturbance was frequently noted, which had the appearance of slight contact or leakage from wire to wire. A careful examination of the entire line was made, and many small defects removed, but the interference continued.

Advantage was taken of the breakage of the Irish cable in August, 1874, to institute careful experiments to determine the nature of these interferences, and the two lowest wires on the side of the poles farthest from the railway were tested. The ends were led down into the experimenting room, and careful tests were taken.

A Bain chemical printing telegraph was used to record the results. It was fitted with two styles, insulated the one from the other, and the metal barrel over which the paper passed was also insulated. One style was connected to earth, the other to the wire under experiment. These + currents were registered by one of the styles, and — currents by the other. The paper was prepared by potassium iodide.

The wire was connected to the Bain apparatus, and disconnected successively at various points; it was found that marks were produced on the paper, decreasing in amount as the line was shortened, ceasing altogether when the line was disconnected at Paddington.

An ordinary key connected with a battery of 100 cells was joined to the second wire, and positive currents transmitted. On depressing the key, a short "comet"-shaped dash was marked upon the paper, and in raising the key a fainter but more elongated dash appeared at the style connected with the earth, but no trace whatever was found on the paper in the interval between the depression and raising of key. The effect was purely one of "induction," and the shifting from one style to the other was caused by the change in the direction of the induced current.

When the wires were insulated or disconnected at the distant end, the marks were always tapering, and were gradually reduced in magnitude as the line was shortened; but when the wires were put to earth at the distant end, the marks were square-ended dashes, not tapered, gradually diminishing in length and depth of color as the line was shortened, and disappearing altogether in both cases when the London underground section alone remained in circuit. A speaking instrument was fixed at Holyhead. Signals were sent from a battery of 48 cells, and the

commencement and close of every signal was indicated on the paper by the inductive effect of the speaking wire, or that connected to the Bain apparatus; but no trace of a mark appeared during the time the current was maintaining the signal, proving clearly that the effect was not due to leakage from wire to wire.

It was noted that wires on which double currents, or reversals, are used, interfere with each other much more than when single currents are employed. This is what might be expected from the well-known laws of induction.

From these experiments it was seen that when a number of wires were placed on the same pole, the induction is greatest between wires on the same side of the pole, and hanging one above the other; that this induction is more evident with the two lowest wires, as there is less interference from the other; that the induction between wires on opposite sides of the poles is less as their distance is greater from each other; that the induction between wires on opposite sides of the poles decreases as the length of the arms increases.

The Bain apparatus, in these experiments, was found most useful, a great advantage being that it gives a perfect record of all that may be passing at the time, and shows accurately the strength of the current.

As has been stated, no inductive action could be traced between wire and wire in the underground pipes between the central station and Paddington, although they are 4 miles 457 yards long. No effect was produced, even by as high an electro-motive force as 100 cells, as regards induction between wire and wire. Yet a very marked effect was observed even with but 24 cells, as between wire and earth, and greater than was observed with similar battery power when the wires were disconnected at Oxford.

Nor is there any record that induction between wire and wire was noticed on the buried wires formerly existing between London and Liverpool, though the discharge to earth was very violent. Moreover, having occasion to ascertain the speed on a circuit from Lowestoft to Holland and back, by the courtesy of the Submarine Company, a wire in each of the two Zanesvoort cables was used.

During the experiment, which lasted five hours, and was made with iodide paper, no trace of induction from the neighboring wires through which the ordinary traffic was proceeding could be observed.

A similar result has been observed in England as respects the "Hughes" printing instrument, and the wires have consequently been placed on several lines at a much greater distance apart.

We are also taught that a very little dependence can be placed on speed trials conducted at night, or on Sundays, when there are but few wires working, or on mere laboratory experiments.

## A CHEAP TANGENT GALVANOMETER.

A correspondent of the *English Mechanic* gives the following good and cheap plan for making a tangent galvanometer: Procure a strip of copper,  $\frac{1}{8}$  inch thick,  $\frac{7}{8}$  inch wide, and 36 inches long; bend this into a circle having a diameter of 12 inches, which will leave a space of  $1\frac{1}{2}$  inches between the two ends; fasten these ends on to a wooden frame, and to each end attach a wire, which is also connected to a binding screw. Thus you will now have a copper ring supported on a wooden frame, having two binding screws. Next make a strip of wood to go across the horizontal diameter of the circle. This can be cemented to the copper ring, or may have a

groove for the ring to fit into each side. The strip of wood might be  $1\frac{1}{2}$  inches wide, and on the center of this have a delicate compass, with needle about 10 inches in length, working over a graduated card. The needle may either work on a fine pivot or be suspended by a piece of unspun silk from top of copper band.

## ELECTRICAL RESISTANCE OF VARIOUS METALS.

M. Benoit has measured with great precision the electrical resistance of various metals at temperatures from 0° to 860°. He employed both the method of the differential galvanometer and of the Wheatstone's bridge, and for each method has measured several specimens. The mean of these is given in the following table, the second column giving the resistance of a wire, 39.37 inches long and having a cross section of 0.08 inches in ohms, and column three the same quantity in Siemens' units. Column four gives the resistance compared with silver:

Metal.	Ohms.	Siemens.	
Silver, A.....	0154	0161	100
Copper, A.....	0171	0179	90
Silver, A (1).....	0198	0201	80
Gold, A.....	0217	0227	71
Aluminum, A.....	0609	0634	49.7
Magnesium, H.....	0438	0448	36.4
Zinc, A., at 350°.....	0565	0591	27.5
Zinc, H.....	0594	0631	25.9
Cadmium, H.....	0685	0716	22.5
Brass, A (2).....	0691	0738	22.3
Steel, A.....	1009	1149	14
Tin.....	1161	1214	13.3
Aluminum bronze, A (3).....	1199	1248	13
Iron, A.....	1216	1273	12.7
Palladium, A.....	1384	1447	11.1
Platinum, A.....	1575	1647	9.77
Thallium.....	1681	1914	8.41
Lead.....	1995	2075	7.70
German silver, A (4).....	2654	2775	5.80
Mercury.....	2664	10000	1.61

A, annealed; H, hardened; (1) silver 75; (2) copper 64.2, zinc 33.1, lead 0.4; (3) copper 90, aluminum 10; (4) copper 50, nickel 35, zinc 35.

These results, which are all taken at 0°, agree closely with those obtained by other observers. M. Benoit has extended his observations to a range of temperature much greater than those previously employed for this purpose. He wound the wire around a clay pipe inclosed in a muffle, and immersed the whole in a bath of water, mercury, sulphur or cadmium, which was kept at a boiling point by a Perret furnace. Constant temperatures of 100°, 360°, 440°, and 860° were thus obtained. Various temperatures below 360° were also obtained by a mercury bath. The measures were also corrected for expansion. Plates annexed to this memoir, presented to the Faculty of Sciences of Paris, show the results graphically. They show that the resistance increases regularly for all metals like tin, lead and zinc up to their points of fusion. This increase, however, differs for different metals. We notice that tin, thallium, cadmium, zinc, lead, are found together in the upper part of the plate; at 200° to 280° their resistance has doubled. Below them are iron and steel; for the last the resistance doubles at 180°, quadruples at 430°, and at 860° is about nine times that at 0°. Palladium and platinum, on the other hand, increase much less, and only double their resistance at 400° to 450°. Gold, copper and silver form an intermediate group. In general the conductivity decreases more rapidly in a metal the lower its point of fusion. Iron and steel are exceptions to this rule. In alloys the variation is always less than in their constituents, and this is especially the case with German silver.—*Silliman's Journal.*

## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

Is there any additional charge for the hour and minute in the date of a message—thus: "Chicago, Ill., 20th, 5:30 P. M."?

Answer.—Yes.

COLDWATER, Mich., April 21.

To the Editor of the Journal of the Telegraph:

Please say how many words there are in the following message, to wit:

"TOLEDO, O., 21.

"To Kent & Co., Coldwater:

"Forward collect charges if not there. Will give you ninety dollars to go with me. Answer.

"JONES & SMITH,

"Southern Mich. Hotel."

A message written in this form came to me to-day, checked 13 words. I think there are 19 words. Please answer through JOURNAL, and oblige. J.

Answer.—Nineteen words.

To the Editor of the Journal of the Telegraph:

If a man, the head of a family, comes in my office and forbids my sending any message for any of his family that day, and one of his daughters (who is of age) comes in and wants to send one, should I send it or not? Please answer through the JOURNAL, and oblige.

Answer.—The message should be received if it conforms to the rules of the Company.

To the Editor of the Journal of the Telegraph:

I am a young operator, having been in the business but about ten months. Am determined to be a good operator if possible, though I am at present in a position where I have but little practice. Can you recommend any work which would assist a beginner who wishes to improve in the business? Qx.

Answer.—You will derive much benefit from the works of Culley, Pope, and Prescott, either or all. They contain all the theoretical knowledge necessary to be understood by the practical operator.

To the Editor of the Journal of the Telegraph:

A party from a train presents a message written on a slip of paper, together with the required amount of money to pay for its transmission, and hurries off. Should the message be sent? OPERATOR.

Answer.—Yes. If there was not sufficient time for the party to write it upon or affix it to an official blank the receiver should affix it as the sender's agent, making a note of the circumstance.

Manager.—There are five words in "Frank D. Beane, M. D."

D., New Orleans.—Your letter is a painful one, but to which we cannot reply.

W. H. Race.—M. A. Buell, Cleveland, Ohio.

ON MAGNETISM.—M. A. Treve.—Referring to the discovery of De la Rive, that if in Ruhmkorff's great electro-magnet the current is closed between the two poles there is neither spark nor sound, but on opening it there is a detonation almost like a pistol shot, the author states that the phenomenon announced by De la Rive is equally produced in the sphere of attraction of either pole; that it is not inherent in an inductor current alone, but that the current of any independent battery, interrupted in this sphere of attraction, gives rise to the same effects, and that the extra current augments the tension really and considerably.

## A TELEGRAPH POLE OF WROUGHT IRON.

There is now being built at the machine shop of Messrs. Townsend, Jackson & Co., in this city, an iron telegraph pole, ordered by the Western Union Telegraph Company, which is to be placed on the corner of Broadway and Twenty-third street, one of the most prominent points of observation in the City of New York. It is the invention of an Albanian, and of entirely novel construction compared with the method of making iron poles heretofore. It is the first practical invention that has ever brought such an article down to a cost sufficiently low as to compete with the use of wood, and it is claimed by the inventor that this can be done, under his patent, not only in the case of the large and costly poles used in cities, but even in the small and cheap ones used along the railroads and highways of the country.

When completed, it is lighter than a wooden pole of the same height, far stronger, and capable of supporting a much greater weight. Being of iron, it is of course more durable, and with proper care will outlast ten wooden poles. It is constructed of a number of wrought iron bars, rolled out the entire length of the pole, which bars are placed around light cast iron cores, arranged at proper intervals from each other. The cores have seats or notches to hold the bars in their places to prevent their moving sideways, and the bars also have notches into which the cores fit to keep them from moving up or down. Around the outside, where each core is placed, a ring or band of wrought iron is tightly fitted, which holds the bars firmly in their places, and thus forms the whole into a light, open and graceful column. Any number or any size of bars may be used, but it is found that six very light bars of angle iron arranged in this way afford a strength that fully meets that required for a telegraph pole of fifty feet in height. The cores are large at the base and are made smaller as they approach the top, which gives the column a graceful taper, and the whole is surmounted by a suitable cross head to hold the arms for the wires. Such a column is very simply constructed and is without a rivet throughout its entire length. No machinery or shop labor is required to put it together other than the making of the outside rings or bands by an ordinary blacksmith, so that a pole may be ordered in pieces and put together at the point where it is to stand. The column is suitable not only for telegraph poles but for masts for iron ships, derrick masts and booms, stringers for bridges, lamp posts, and a variety of other purposes.

We understand it is the intention of the Western Union Telegraph Company to introduce these poles in New York and other large cities, and we feel assured it is a move in the right direction. Iron poles have long been in use in all the cities of Europe, and this Company does not intend to allow the enterprise of our American telegraph genius to be outrivalled or surpassed by that of any other nation. Independent of the symmetrical beauty of each pole made of this pattern, the very fact of uniformity in the construction and appearance of all the telegraph poles in a city, will take away much of the unsightliness at present complained of in regard to the wooden ones, and we are not sure but they will be more ornamental than otherwise in the streets. It is an easy matter to attach a street lamp to each pole, and thus make it serve a double purpose. It is considered by the most experienced telegraph men to be impracticable to lay the wires underground in the side streets of New York, and as soon as a scheme of rapid transit is decided upon, a suitable provision will doubtless

be made in connection with it to accommodate all the wires in the city that run north and south. In the meantime iron poles are unquestionably better than wooden ones, and the use of iron lamp-posts in cities for so many years past, has proved that all things of a similar nature, that stand in the streets exposed to the public gaze, should be durable, ornamental and uniform.—*Albany Eve. Journal.*

## ELECTRIC LATHE CHUCK.

In order to obviate the inconvenience and loss of time involved in the ordinary mode of fixing upon a lathe chuck certain special kinds of work, such as thin steel disks or small circular saws, the chuck is converted into a temporary magnet, so that the thin steel articles, when simply placed on the face of the chuck, are held there by the attraction of the magnet; and, when finished, can be readily detached by merely breaking the electric contact and demagnetizing the chuck. The face plate of the magnetic chuck is composed of a central core of soft iron, surrounded by an iron tube, the two being kept apart by an intermediate brass ring; and the tube and core are each surrounded by a coil of insulated copper wire, the ends of which are connected to two brass contact rings that encircle the case containing the entire electro-magnet thus formed. These rings are grooved, and receive the ends of a pair of metal springs connected with the terminal wires of an electric battery, whereby the chuck is converted into an electro-magnet capable of holding firmly on its face the article to be turned or ground. For holding articles of larger diameter, it is found more convenient to use an ordinary face plate, simply divided into halves by a thin brass strip across the center; a horse shoe magnet, consisting of a bent bar of soft iron, with a coil of copper wire round each leg, is fixed behind the face plate, each half of which is thus converted into one of the poles of the magnet. The whole is enclosed in a cylindrical brass casing, and two brass contact rings fixed round this casing are insulated by a ring of ebonite, and are connected with the two terminal wires of the magnet coils. A similar arrangement is also adapted for holding work upon the bed of a planing or drilling machine, in which case the brass contact rings are dispensed with, and any desired number of pairs of the electro-magnetic face plates are combined so as to form an extended surface large enough to carry large pieces of work. For exciting the electro-magnet, any ordinary battery that will produce a continuous current of electricity can be used; but in machine shops, where power can be obtained, it is more convenient to employ a magneto-electric machine—such as Gramme's, for instance—rather than a battery.—*Scientific American.*

EXPERIMENTS are now being carried on in Paris, for the Prussian Government, with a view to projecting a condensed beam or cone of electric light to a great distance. The apparatus employed consists of an iron tube about 1½ yards in diameter, by 1 yard long. The front opening contains a large lens, which completely covers the aperture, while the other extremity is closed by a copper lid, to which is affixed a reflector. In this lid two apertures are provided, whereby the state of the electric light, the carbon points, &c., can be examined. The distance between the carbon points is regulated by clockwork. The range of the instrument is said to be about fifteen kilometres (about ten miles).

THE duplex is in use in England on twelve thousand miles of wire. The longest circuit is 450 miles.

## A CANDIDATE FOR THE BIG LEATHER MEDAL.

The following dispatch from Washington, which appears in the *Springfield Republican* of April 20, must have been contributed by the agent of the Society for the diffusion of useless misinformation:

"WASHINGTON, Monday, April 19.

"The quadruplex telegraph case is again before Secretary Delano, that official claiming the right to revise and reverse the action of the Commissioner of Patents. Edison was the patentee, but a joint application for the patent was made by Edison & Prescott. Edison withdrew from the firm, and sold his claims to the Automatic Telegraph Company; Prescott sold his to the Western Union. The Commissioner of Patents having decided in favor of Edison as sole patentee, Mr. Delano is appealed to to over rule. Senator Conkling appears for the Automatic, and denies the Secretary's jurisdiction; Gen. Butler for the Western Union. Mr. Delano allows 25 days for the presentation of arguments."

As a slight correction of the above, it may be noted that the case was not *again* before Secretary Delano, it being the first time that this or any other patent had ever been carried before him in this manner; also that he did not set up any claim to revise and reverse the Commissioner's action. A joint application for the patent was not made by Edison & Prescott. Edison did not withdraw from the firm, nor sell his claims to the Automatic Company, but to the Western Union. The Commissioner of Patents did not decide in favor of Edison, but against him. Senator Conkling did not appear for the Automatic, but against it, nor did General Butler appear for the Western Union, but for Edison, and against the Western Union, so far as they may be supposed to be interested in the success of Prescott's claims. Otherwise the statement is not essentially inaccurate. It reminds one of the savans of the French Academy, who were getting up a dictionary, wherein they described a crab as "a small red fish, which walks backward." On submitting this definition to Cuvier, the celebrated naturalist, the latter remarked: "Gentlemen, the crab is not a fish, it is not red, and it does not walk backwards; with these exceptions your definition is sufficiently accurate."—*The Telegrapher*.

## ANECDOTE OF PRIESTLEY.

BY H. C. BOLTON, PH. D.

The recent celebrations at Northumberland and Birmingham of the centenary of the discovery of oxygen by Dr. Priestley, brought out many curious incidents in his career, and numberless anecdotes; we select the following as characteristic:

While he was a minister at Leeds, a poor woman who labored under the delusion that she was possessed by a devil, applied to him to take away the evil spirit which tormented her. The doctor attentively listened to her statement and endeavored to convince her that she was mistaken. All his efforts proving unavailing, he desired her to call next day, and in the mean time he would consider her case. On the morrow the unhappy woman was punctual in her attendance. His electrical apparatus being in readiness, with great gravity he desired the woman to stand upon the stool with glass legs, at the same time putting into her hand a brass chain connected with the conductor, and having charged her plentifully with electricity he told her very seriously to take particular notice of what he did. He then took up a discharger and applied it to her arm, when the

escape of the electricity gave her a pretty strong shock. "There," said she, "the devil's gone, I saw him go off in that blue flame, and he gave me such a jerk as he went off. I have at last got rid of him, and I am now quite comfortable."—*American Chemist*.

## NEW DISCOVERIES ON THE ACTION OF GALVANISM ON THE THROAT.

The Faculty of Jefferson Medical College, Philadelphia, have recently conducted a series of interesting experiments upon the body of an executed criminal, which have revealed several novel and important facts in physiological science. Dr. W. W. Keen, after dissecting the chords of the neck which connect with the larynx, galvanized each in turn. When the left chord was galvanized, this only responded, and the same was the case with the right. It was found that there was no crossing of the chords from one side to the other, and that the action of each was distinct and independent. The doctor also examined and galvanized separately the external and internal intercostal muscles (between the ribs), and found that their function was not uniform but different. Physicians have long been at variance on this question, but the present discovery seems to settle the matter, since it proves that the external muscles are for expiration and the internal for inspiration. It has been believed by some that, by the application of galvanism, vitality can in a measure be revived. This impression is incorrect, for while the application of a battery, to the cadaver from which life has been extinct but a short time, will serve to produce muscular action, the result shows that only a portion of the body, and not the brain, is excited by external power.

## THE ELECTRICAL CONDITION OF AIR IN THE ARCTIC REGIONS.

M. Vicjander, during one of the recent Swedish expeditions to the Arctic regions, made extended investigations into the electrical condition of the air there existing. All of his observations agree in showing that the atmosphere conducts electricity at temperatures relatively high, a circumstance to which may be attributed the absence of thunder and the presence of the aurora borealis. It has been suggested that this is due to the great humidity of the air in such regions; but it is evident that the phenomenon must be ascribed to other causes, since the same temperature and the same degree of humidity do not produce a like effect in the lower latitudes. At less temperature—4° and—13° Fah., and below, the air isolates better.

Generally the Arctic atmosphere appears to be positively electrified, and the earth negatively. In several instances, the air was effectively electric of itself, and this is not due to terrestrial induction. During certain periods of the Spring, at a time when the air isolated relatively well, both ground and air were charged with negative electricity. This change of electrical state of the atmosphere was not a constant consequence of greater cold; but when the temperature had been lowered for some time, the air had an evident tendency toward a negative condition.

There seems to be a natural connection between these facts and the aurora. During the months of January and February, the latter phenomenon appeared daily, and was especially noticeable on the 19th and 26th days of the latter month. It then disappeared, to reappear, however, on the 2d of March.

At the same time, changes in the electricity of the air were observed, suggesting the theory that the negative electricity, deprived of the possibility of discharging itself into the aurora, was obliged to accumulate in the lower atmospheric strata, which isolates relatively well. From the 2d to the 11th of March, the aurora returned; and during this period the air was in a good conducting condition, or else, when effecting isolation, was positively charged. Subsequent to the latter date, the auroras ceased entirely, and an interval supervened of low temperature, with negatively electrified air, which lasted until the increasing light of the season of the year precluded further auroral observations.

**CURIOUS EFFECT OF LIGHTNING ON COPPER.**—Some curious effects of lightning on the wires of an electric clock on a steeple in Basle have been described by M. Hagenbach in a recent number of *Poggendorff's Annalen*. The wire, which was sheathed in gutta-percha and cotton, was torn away, and lay about in pieces of 1 decimetre to 1 metre in length. These pieces at first sight presented nothing remarkable, but they were found to have quite lost their stiffness, and further examination showed that they consisted only of the gutta-percha and cotton sheath; the copper was entirely gone. The fine canal the copper had occupied was quite smooth, and the sheath was whole, except in a few places at various intervals, where there were ruptures a few millimetres in width. These were evidently the holes at which the copper had escaped—some remains of the metal sticking in them showed it. These remains distinctly proved, too, that the copper had been driven out, for the most part, in a molten state. The intense discharge must have been limited to a very short time; for the molten copper was expelled before its heat could act upon the sheath, which was quite uninjured throughout considerable intervals. Another striking fact is, that in a portion of the wire which was inclosed for protection in a lead pipe, the copper was quite unchanged, while the gutta-percha sheath had evidently been fused in several places. M. Hagenbach thinks the lead pipe here acted by retarding the current in discharge; thus the wire had time to give up its heat to the sheath.

**ACTION OF ELECTROLYTIC OXYGEN ON VINIC ALCOHOL.**—*M. A. Renard*.—When vinic alcohol, mixed with about 5 per cent. of water acidulated with one-fourth of sulphuric acid, is submitted to the current of four or five Bunsen elements, there is observed an abundant escape of hydrogen gas at the negative pole, whilst at the positive pole no gas is disengaged, the oxygen being consumed in oxidizing the alcohol. After forty-eight hours, when operating upon about 100 c.c. of a mixture of alcohol and acidulated water, the experiment is concluded. The liquid has a faint amber tint. If distilled, it begins to boil at 42° to 43°, and its boiling point gradually rises to 80° C. The distillate, treated with chloride of calcium, sends up to its surface a liquid of a powerful odor, the quantity of which increases on adding water to the saline mixture. If the liquid is submitted to fractional distillation, it yields formiate of ethyl mixed with aldehyd, and a large quantity of acetate of ethyl; but, besides these products, these are formed acetal, and a new body—monoethylate of ethylen. These two compounds, in spite of their elevated boiling points (88° to 90° and 104°), are nevertheless found among the first portions which distil over, by reason of their small proportion.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, May 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Hereafter the tariff from San Diego, Cal., to points on other lines in Arizona, will be as follows:

Camp Verde,	75 3
Fort Yuma,	25 1
Florence,	50 2
Maricopa Wells,	50 2
Phoenix,	50 2
Prescott,	75 3
Tucson,	75 3
Wickenburg,	50 2
Indian Wells, Cal.,	closed.

Business for Caledonia, Pulaaki Co., Ill. (W. U. office closed in JOURNAL Oct. 1st, 1874), may be sent and checked to New Grand Chain.

Iowa, Ill., re-opened, check direct.

Bayou Beuf, La., closed.

Tigerville, La., closed.

Last Lynn, Mo., office opened in JOURNAL of April 1st, should read East Lynn.

Elkhorn, Neb., is now a W. U. office in square 464, check direct.

Athens, N. Y., re-opened.

Oriskany, N. Y., re-opened.

Lake View, Chautauque Co., N. Y., re-opened, square 133.

The P. O. A. of Quarantine, S. I., N. Y., is Stapleton, S. I.

The P. O. A. of W. Panama, N. Y., has been changed to Panama.

Morrisville, N. C., closed.

Tioga, Pa., printed in Tariff Book as another line office, is in Tioga Co.

Messages for the Centennial Grounds, W. Phila., will be delivered from Philadelphia for 50 cents each.

La Para, Texas, closed.

Irontdale, W. Va., closed.

## NEW OFFICES.

- \* Stanwix, Arizona, 50 2 from San Diego, Cal.
- \* Campo, Cal., 25 1 " San Diego.
- \* El Monte, " 30 10 " Los Angeles.
- \* Norwalk, " 30 10 " "
- \* Angola, Ind., 45 3 " Fort Wayne.
- \* Fremont, " 40 3 " "

457 Walnut, Ks.

234 Richmond, Ky.

138 Summit, Ogemaw Co., Mich.

45 Melrose, N. Y.

33 Farmingdale, L. I., N. Y.

38 West Flushing, L. I., N. Y.

169 Burton, O.

159 West Farmington, O.

131 Armstrong's, Allegheny Co., Pa., P. O. Buena Vista.

Messages taken for Tioga, Philadelphia Co., Pa., are delivered from Philadelphia. Charges for delivery, 75 cents.

133 Amherst, C. H., Va.

## TO OFFICES IN SQUARES 26 AND 297.

Hereafter the tariff between squares 26 and 297 will be \$1.50 instead of \$1.25, as at present.

The tariff from offices in square 297 to square 450 should be \$1.00. Offices in square 297, whose tariff sheets show a different rate, will make the necessary correction.

## CUBA CABLE BUSINESS.

Hereafter the tariff to Olenfuegos, Cuba, will be as follows: From W. U. offices east of Mississippi River, including St. Louis, Mo., \$6.00—50.

From W. U. offices west of Mississippi River (except St. Louis, Mo.), and from New Brunswick and Nova Scotia, \$7.00—50.

† For each additional 5 or fraction of 5 words.

WILLIAM ORTON, President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT 75, ISSUED APRIL 29, 1875.

## Death of William Lee Allen.

William Lee Allen, of Key West, Fla. (Certificate No. 2,302, issued August 25, 1874.), of yellow fever.

One dollar for assessment 75 is due from members holding certificates numbered up to and including No. 2,424.

RECEIPT OF ASSESSMENTS—NEW YORK, APRIL 24, 1875.

## ASSESSMENT No. 75.

21, 29, 131, 143, 203, 211, 217, 277, 289, 312, 464, 555, 626, 742, 858, 859, 873, 880, 932, 1024, 1154, 1178, 1182, 1199, 1333, 1357, 1489, 1503, 1516, 1532, 1863, 1996, 2066, 2240, 2287, 2298, 2164, 2322, 2399, 2415, 2422, 2423, 2425, 2426, 2427, 2428, 2523, 2430, 2431, 2432, 2433.

## ASSESSMENT No. 74.

5, 13, 17, 23, 25, 54, 59, 60, 73, 74, 75, 80, 89, 91, 99, 100, 108, 114, 139, 141, 142, 144, 153, 178, 183, 184, 188, 220, 240, 247, 254, 274, 278, 279, 281, 282, 283, 285, 302, 319, 344, 351, 361, 378, 379, 380, 381, 391, 430, 431, 438, 456, 510, 533, 554, 566, 569, 574, 576, 586, 603, 605, 617, 622, 661, 667, 678, 680, 685, 703, 706, 714, 729, 735, 750, 751, 756, 791, 799, 803, 808, 825, 831, 848, 855, 870, 874, 901, 916, 927, 939, 943, 943, 976, 978, 991, 992, 998, 1023, 1038, 1040, 1047, 1058, 1063, 1074, 1076, 1085, 1098, 1127, 1143, 1155, 1156, 1157, 1159, 1160, 1163, 1164, 1175, 1185, 1200, 1205, 1226, 1227, 1237, 1238, 1241, 1266, 1270, 1304, 1307, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1364, 1365, 1372, 1438, 1451, 1454, 1455, 1456, 1482, 1498, 1500, 1501, 1505, 1506, 1507, 1508, 1515, 1522, 1524, 1527, 1531, 1532, 1550, 1555, 1562, 1564, 1572, 1579, 1580, 1582, 1589, 1593, 1594, 1623, 1625, 1626, 1634, 1644, 1656, 1658, 1660, 1661, 1662, 1663, 1665, 1681, 1695, 1707, 1708, 1721, 1723, 1745, 1773, 1775, 1791, 1795, 1796, 1797, 1804, 1809, 1810, 1811, 1812, 1818, 1823, 1824, 1844, 1845, 1847, 1881, 1903, 1907, 1916, 1919, 1931, 1938, 1942, 1950, 1953, 1954, 1991, 1999, 2000, 2001, 2005, 2025, 2026, 2028, 2040, 2045, 2048, 2057, 2061, 2084, 2113, 2114, 2118, 2119, 2123, 2125, 2131, 2133, 2138, 2159, 2162, 2167, 2169, 2173, 2175, 2180, 2187, 2192, 2196, 2202, 2204, 2205, 2206, 2212, 2244, 2290, 2295, 2296, 2297, 2298, 2305, 2308, 2319, 2318, 2321, 2338, 2340, 2346, 2351, 2352, 2358, 2387, 2392, 2393, 2394, 2395.

## ASSESSMENT No. 73.

27, 51, 70, 237, 238, 242, 246, 258, 451, 453, 455, 457, 652, 801, 804, 964, 1103, 1153, 1207, 1279, 1600, 1603, 1605, 1607, 1608, 1609, 1639, 1653, 1655, 1657, 1690, 1691, 1692, 1715, 1716, 1731, 1786, 1835, 1934, 1941, 1968, 1974, 1975, 1976, 1978, 1995, 2037, 2123, 2177, 2280, 2320, 2328, 2353, 2375, 2376, 2377.

## ASSESSMENT No. 72.

1951, 2312, 2314, 2316, 2517.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid will please take notice, that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## TELEGRAPHIC CONVENIENCES FOR LAWYERS.

The Law Telegraph Company of this city begin operations with about 60 connections. By the aid of its wires subscribers are placed in direct and private telegraphic communication with the different Courts, and Sheriff's, Register's and County Clerk's offices, &c., and they are able, besides, to communicate privately with each other. Lawyers and others can also, by means of the instruments in their offices, send telegrams to any part of the country over the Western Union lines, each office being by this means made a branch office of the Company. Connection with the various Brooklyn Courts will soon be effected. The main object and distinctive feature of the enterprise lies in the fact that by its aid lawyers are enabled to get timely notice of the approach of their cases for trial, and thus to save the hours and even days that are frequently wasted in the attendance in Courts. The Company has its reporters and operators in the Courts and public offices, who send notice to subscribers of news affecting

them. The instruments used to the Company are dial instruments of a new pattern and easily operated. The officers of the Company are as follows: President, Homer A. Nelson; Vice-President, Daniel B. Childs; Secretary, B. Drake Smith; Treasurer and Manager, William A. Childs; Engineer, Charles T. Chester; Board of Directors, Homer A. Nelson, Charles H. Wight, Herbert G. Hull, Charles T. Chester, Daniel B. Childs, B. Drake Smith, and William A. Childs.

## HOW TRAINS ARE RUN THROUGH BERGEN TUNNEL.

It is claimed by the Managers of the Erie Railroad that the system of signals in use at their tunnel through Bergen Hill, N. J., is the safest and best that is in use at the present day for the running of trains through a tunnel. A visit to the east end of this tunnel, and an examination of the machinery and its workings, will at once show the spectator that all the care possible is taken to prevent accidents of any sort. The electric signals, by which this plan of running trains is carried out, are connected by insulated wire or covered wire running over the hill, thus making the connection between the two signal houses, which are at each end of the tunnel. In each of these houses is an electrical signal machine, which is so arranged that when the key is closed at one end of the tunnel the bell strikes four times at the other end, and by this the signal man knows that a train has just passed out at the other end all right, and that he can let in another. It is a rule that two trains shall not be let into the tunnel at one time on the same track, and that on the rear of each train must be a red light, and the signal man, whose duty it is to send back the signal "All right," must see that the train had such lights on the rear of the car when it passed by the signal house. In a busy time, the two roads that use this tunnel, the Erie, and Delaware, Lackawanna and Western, often run as many as 300 trains through in a day, and it is often the case that two trains bound West come up to the mouth of the tunnel, or the place where they are all obliged to stop before going in, at nearly the same time, and the train that stops first has the right of way in the tunnel, the other not being allowed to start in until the one preceding it has been signaled back as having passed through all right.

**BENEFIT OF LAUGHTER.**—Probably there is not the remotest corner or little inlet of the minute blood vessels (life vessels) of the body that does not feel some wavelet of that great convulsion (hearty laughter) shaking the central man. The blood moves more lively—probably its chemical, electric, or vital condition is distinctly modified—it conveys a different impression to all the organs of the body as it visits them on that particular mystic journey when the man is laughing, from what it does at other times. And so, we doubt not, a good laugh may lengthen a man's life, conveying a distant stimulus to the vital forces. And the time may come when physicians, attending more closely than at present unfortunately they are apt to do, to the innumerable subtle influences which the soul exerts upon its tenement of clay, shall prescribe to a torpid patient "so many peals of laughter, to be undergone at such and such a time," just as they now do that far more objectionable prescription a pill or an electric or galvanic shock; and shall study the best and most effective method of producing the required effect in each patient.

## ANGLO-AMERICAN TELEGRAPH.

The half-yearly report states that, in accordance with the wish expressed by the proprietors at the two last meetings, the directors agreed that a report and accounts should be presented half-yearly, and as a final settlement of the question they propose—

1. To hold two meetings in the year, in the months of April and October.
2. To publish no accounts or receipts at any other period of the year.
3. To pay interim dividends quarterly, whenever the revenue of the Company enables them properly to do so.

The total receipts from the 1st January to 31st of December, 1874, including a balance of £9,089, carried over from last account, amount to £718,018, which, with the renewal fund of £254,947, now carried to revenue account, amount together to £967,966. The total expenses of the year, including those of laying the new cable and income-tax, amount to £614,282. Three quarterly dividends at the rate of 5 per cent. per annum, free of income-tax, were paid in 1874, absorbing £262,500, leaving a balance of £91,183, from which a final quarterly dividend, at the like rate of 5 per cent. per annum, has since been paid, amounting to £87,500, leaving a balance of £3,683 to be carried forward to next account. The falling off in the traffic receipts in 1874, as compared with 1873, amounting to £62,918, is to be attributed to the depression of the American trade which existed more or less during the whole period. The directors regret that they have been unable to recommend the declaration of a higher dividend than 5 per cent. for the year ending 31st December, 1874, but an examination of the accounts will show that a larger payment would have been extremely imprudent. It may be urged, and with some show of reason, that unusually large sums have been taken from revenue and spent upon new works; but unless the capital of the Company were enlarged for this purpose, which the directors consider most undesirable, the course pursued was inevitable; and the directors believe that their policy in this respect will meet the approval of the proprietors. The proper figure at which to fix the tariff has long been the subject of anxious consideration by the directors. Large customers and many of the proprietors have frequently represented to the directors the expediency of keeping up the rate at 4s. per word; and although all the experience obtained has shown that the present rate, combined with this Company's system of charging by the word, is one which offers the greatest facilities to the public, consistently with making reasonable profits for the proprietors, still, in view of competition at an early date, the directors resolved to reduce the tariff to 2s. per word from the 1st of May next. The contract for the construction and laying of a fifth cable, announced in the last yearly report, was duly and efficiently carried out by the Telegraph Construction and Maintenance Company. On this occasion the cable was laid from Newfoundland to Valentia; the operation was perfectly successful throughout, not a hitch of any kind having occurred. The Great Eastern and her consort, the Hibernia, started from this country on the 9th August; arrived at Heart's Content, Newfoundland, on the 23d August, and after the shore ends had been laid, the Great Eastern commenced paying out the cable toward Ireland on the 26th August, and arrived off the Irish coast on the 6th September; the final splice was made on the 8th September, and the laying of the 1874 cable was thus completed in thirteen days. The new cable, both in point of insulation and carrying capacity, is the best yet laid across the Atlantic. The vessel which the directors have purchased to replace the Robert

Lowe, which was lost last year, is the steamship *Minia*, a much larger ship, and able to effect repairs both in deep and shallow water. She is an iron vessel of 1,986 tons register. Her fittings are in every respect suitable for the work upon which she will be employed, and she has been encased in a wooden sheathing  $4\frac{1}{2}$  feet above and  $4\frac{1}{2}$  feet below the water-line, to protect her against ice. Great care has been exercised in providing her with an efficient captain and crew, and she has already executed very valuable work for the Company. Her first operation was the repair of the 1866 cable, broken off Ireland, which was effected on the 14th July, 1874, and her presence in Placentia Bay, in September, when the whole of the Company's shoal water cables were interrupted by a storm, lasting several days, and on which occasion she executed the necessary repairs in a few hours, preventing a loss to the Company of a large amount of traffic receipts. The stock of cable put on board to enable the vessel to make repairs has cost a large sum of money, but this expense was one which could not be avoided.

The report of the Brazilian Submarine Telegraph Company shows that the total earnings for the half year were £80,027, and the working expenses £10,463, leaving £50,164 as profit, which, with £2,586 (the net profit before the 1st July, 1874), makes a total of £52,751. First and second interim dividends, amounting to £32,500, have been paid, leaving, after deducting £439 for income tax, a balance of £19,811 to be carried forward.

The ordinary half-yearly meeting of the Anglo-American Telegraph Company was held April 9, in London, when the report of the directors was adopted. At the extraordinary meeting, which was subsequently held, to consider the propriety of dividing the stock into preferred and deferred, no resolution upon the subject was submitted, it being understood that the directors had a majority of proxies in opposition to such proposal.

The number of messages passing over the Cûba Submarine Telegraph during the month of March was 2,686, estimated to produce £2,700, as against 889 messages, producing £908, in the corresponding month of last year.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending the 27th of March, 1875, was 332,257, and during the corresponding week of 1874, 359,542, being a decrease in 1875, of 27,285. Easter has fallen earlier this year than in 1874, which accounts for the decrease shown.

The total number of messages forwarded from postal telegraph stations in the United Kingdom for the week ending April 3, 1875, was 375,821, an increase on the corresponding week last year of 61,048.

OWING, it is alleged, to the loss of the *La Plata*, Mr. W. T. Henley, of Woolwich, the eminent telegraph engineer and contractor, has been obliged to suspend payment.

Work on the Fu-Chew telegraph line continues to be interrupted, and considerable additional property of the company has been destroyed by mobs.

TELEGRAPHIC communication is now established between all the important cities of Japan.

At a meeting of the directors of the Globe Telegraph and Trust Company the following interim dividends have been declared for the quarter end-

ing the 18th inst. On the preference shares 3s. per share, being at the rate of 6 per cent. per annum, and on the ordinary shares 2s. 6d. per share, being at the rate of 5 per cent. per annum.

THE directors of the Eastern Extension (Australia and China) Telegraph Company have resolved to declare a final dividend of 4s. per share, making, with the three interim dividends already paid, 64 per cent. for the year ending 31st December, 1874, free of income tax, carrying forward to reserve fund £32,839, making a total reserve of £75,453.

THE directors of the Western and Brazilian Telegraph Company have declared an interim dividend of 5s. per share for the quarter ending the 31st of March last, payable on the 15th inst.

THE traffic receipts of the Direct Spanish Telegraph Company for March, 1875, amounted to £1,475 against £1,104 in February.

THE traffic receipts of the Eastern Telegraph Company for the month of March, 1875, amounted to £33,285, against £31,899 for the corresponding month of 1874.

THE traffic receipts of the Eastern Extension (Australia and China) Telegraph Company for March, 1875, amounted to £18,730, and for the corresponding month last year £19,530.

THE receipts of the Submarine Telegraph Company for the month of March, 1875, amounted to £9,289. The receipts for the corresponding month of 1874, were £9,561.

## MAGNETIC RAILWAY RAILS.

M. Heyl, engineer of one of the German railways, in a recent report upon the special section under his charge, calls attention to the development of magnetism in the rails. He says: "I have observed that all the rails are transformed at their extremities after they have been placed in position a few days, into powerful magnets, capable of attracting and of retaining a key, or even a heavier piece of metallic iron."

"These rails preserve their magnetism even after they have been removed, but they lose it gradually. When in position, however, the magnetism is latent, only becoming free when the chairs are removed, and disappearing again when they are replaced. Hence it is necessary to assume that two opposite poles come together at each junction, and that each rail is a magnet, the poles being alternately reversed throughout the line. This production of magnetism in the rails examined is undoubtedly attributable to the running of the trains, and to the shocks, friction, etc., thereby produced. The hypothesis of electric currents, induced or direct, must be rejected, since it is negated by experiments upon the subject made with suitable apparatus." Although the interest attaching to the fact above stated is at present purely scientific, it is not impossible, says the *Franklin Journal*, that the magnetism thus developed may exercise an influence actually beneficial upon the stability of the roadway, increasing the adherence to the rails and the friction. It is possible, also, that the magnetic currents may be stronger at the moment of the passage of the trains than either before or after. If this be so, the observations may acquire a still higher practical importance.

A DARKEY, left in charge of a telegraph office while the operator went to dinner, heard some one "call" over the wires, and began shouting at the instrument: "De operator isn't yer!" The noise ceased.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

106 Broadway, New York.

NEW YORK, MAY 1, 1875.

The reduction in cable rates to Europe goes into effect to-day.

PARTIES requesting copies of the JOURNAL, and who send no postage stamps to pay therefor, are informed that when these requests come from non-subscribers no paper will be sent, and when from subscribers or managers of offices regularly receiving the same, the copies asked for will, if sent, be mailed with the mail matter of the number of the JOURNAL next published.

THE bill introduced in the New York State Assembly to compel telegraph companies to put their wires underground in the cities of New York and Brooklyn has been killed in the Committee on Cities and Villages, to which it was referred. The Committee, after repeated hearings, by a unanimous vote decided not to report it.

It is to be hoped that this is the end of the matter, for while telegraph companies might be damaged and annoyed by the passage of such a law, no public interest would be served by its enactment. So radical a change as such a law would necessitate requires careful experiment before it is undertaken, in any event, and should not be enforced without due consideration.

WHAT has become of the *Faraday*? She sailed from England on April 5th, to complete the laying of the Direct United States Cable, the end of which she left last Fall buoyed some two hundred miles from the coast of Nova Scotia. She has been out twenty-five days, the cable is not completed, nor has any tidings been received from the vessel.

RIO DE JANEIRO is going to have a fire alarm telegraph and a paid fire department composed of 400 men, in eighteen companies, organized in the same manner as the force in New York.

### OPEN AND CLOSED CIRCUITS.

A correspondent in the London *Telegraphic Journal* asks the question, why England uses open and America closed circuits. The writer gives at the same time the statements of two celebrated English engineers, the one giving data which favors the one method, and the other the other. Culley states that the osmotic action in the Daniell battery, by which is meant simply the intermingling of dissimilar liquids, is assisted by the current. This would seem to prove the wisdom of open circuits, by which the osmotic action would cease to the extent that it is caused by a closed circuit. Mr. Sabine, on the other hand, states that the entry of copper to the zinc chamber is faster when the circuit is open than when closed, and leads to a rapid deterioration of battery power, by reason of the deposit of copper on the zinc. Here is the argument of the closed circuit.

The writer asks in reference to these statements, and citing the English preference of the open and the American for closed circuits, Which is correct?

We answer—both, but with the advantage apparently in favor of the American system. It is undoubtedly true that osmotic action and exosmotic action, which really mean the same thing, are aided by the current. It is equally true that with a closed circuit the action of the zinc element is in excess of the copper element, the exosmosis of which it holds in check. It is also true that an open circuit, too long continued, leads to such a deposit of copper on the zinc as to reduce action of the latter, and consequent waste of material and decrease of power. Thus both the open and the closed circuits have their losses and values. The problem, after all, is what amount of alternately open and closed circuits contribute most to the preservation of constancy, and economic and equal action of the battery elements. We do not believe that there is a margin of advantage in either case, so far as constancy is concerned, from which to prove very marked superiority, yet it would be a useful subject of investigation to determine the actual rates of consumption under the two systems. The apparent advantage of the American plan is in the fact that main batteries are only needed at terminal offices, while the open circuit system requires them at all stations.

### IRON POLES AND VIADUCTS FOR CITY WIRES.

We refer our readers to an article from the *Albany Evening Journal*, which will be found elsewhere, for what seems the practical solution of the treatment of telegraph wires in cities, especially in the City of New York. There can be no objection made to an elegant iron support, especially when it may be made to answer the double purpose of a lamp post and a wire support. The wires themselves are, when neatly arranged, ornamental. For local city purposes, and for such enterprises, for example, as the Gold and Stock Telegraph Company, to lay the wires underground is felt by all well informed parties to be im-

practicable. Air supports seem essential if there is to be any growth in the domestic and local uses of the telegraph, and when these supports can be made ornamental and are so placed as to be unobstructive, the objection to their employment must disappear.

Not less valuable, because true and sensible, is the hint of the opportunity which will be given by the completed viaduct systems in leading out upon such structures the mass of wires necessary for outside connections to reach the "rest of mankind." This can scarcely fail to enter into the plans of rapid transit structures, now evidently approaching accomplishment, and will thus greatly reduce the necessity for wire bearing poles through the city except by these public arteries.

### DECIDEDLY CHEEKY.

The President of the Atlantic and Pacific Telegraph Company states, in his recent annual report, that that Company "has purchased from the inventor, Mr. Thomas A. Edison, and from his business partner and assignee, Mr. George Harrington, the inventions known as the duplex and quadruplex." Now, inasmuch as Mr. Edison had already sold his half of the above-mentioned inventions to the Western Union Telegraph Company, and as the Commissioner of Patents has long since decided that the patents are not to issue to Edison and Harrington, but to Edison and Prescott as the lawful assignees of Edison, we think the above announcement is decidedly the most cheeky thing of the season.

### A NEW DEVICE.

A number of officers connected with the British Indian army have recently been experimenting with a new system of telegraph for use in war, by which for example, communication can be maintained with a city like Paris while under siege. Twelve words a minute have been obtained at distances of 10, 20, and 40 miles, according to the clearness of the weather. It is called a Heliograph, and is the invention of a Mr. Mance. Its elements are similar to the reflecting galvanometer of the Atlantic cable, except that the sun takes the place of the lamp, and a mechanical movement that of the current. A thin line of light is directed to a given point, and an adequate movement of the radiator expresses signs of language. The flashes are invisible to parties not in the direct line of light, hence between elevated points communication could be kept up with a fortress without the knowledge of the besiegers. It is proposed simply as an auxiliary to present methods.

On Thursday morning, April 29th, the friends of Mr. William Holmes, Superintendent of the Tariff Bureau of the Western Union Company, presented him with a beautiful gold watch as a token of their esteem in anticipation of his marriage, which happy event occurred on the evening of the same day. We need not say that the recipient is every way worthy of the gift. We wish him much joy in his new relations.

## THE QUADRUPLIX TELEGRAPH PATENTS.

[From The Telegrapher.]

The controversy in relation to the widely-celebrated Quadruplex Telegraph patents has assumed a new phase. It will be remembered that the invention was claimed by Mr. Geo. A. Harrington, President of the Automatic Telegraph Company, by virtue of a previous contract with Edison, the inventor, although the latter had assigned it to himself and Mr. George B. Prescott, which assignment was duly recorded in the Patent Office. The decision of the Commissioner of Patents that the patent should be issued to Edison and Prescott, as assignees of Edison, and the grounds on which his decision was based have already been published. The Patent Office is a bureau of the Interior Department, and this led some sharp attorney of the Gould-Harrington-Edison combination to conceive the entirely novel and original dodge of making an application to the Secretary of the Interior to overrule the decision of the Commissioner of Patents. The question came up for hearing on Thursday, April 15th, before Secretary Delano. Mr. J. H. B. Latrobe appeared for Harrington, Senator Roscoe Conkling and Mr. J. Hubley Ashton for Prescott, while Edison was most appropriately represented by Gen. Benj. F. Butler, and also by Mr. Leonard Myers, ex-M. C., and late Chairman of the House Committee on Patents. Mr. Butler insisted that the whole case should be re-opened and new evidence introduced in the shape of affidavits from his client, etc., in order to show that the decision of the Commissioner was erroneous. He read Edison's contract with Harrington, and then his contract with Prescott, and then his contract with J. Gould, in order to show him his poor but honest client had been robbed by a series of "wicked partners." He contended that the patent should issue to his client alone, on the ground that, whatever may have been his arrangement with Mr. Prescott, it was in the nature of a partnership, which had been dissolved by the withdrawal of Mr. Edison without his having received a dollar from Mr. Prescott for any interest in it. The patent should not be granted to Messrs. Edison and Prescott conjointly, as the Commissioner of Patents recently ordered, but that it should be issued to Edison, leaving any equities which might be claimed to exist by virtue of assignments to be adjudicated by the courts. Senator Conkling replied at once, raising the question of the Secretary of the Interior's jurisdiction over the matter. He contended that the decisions of the Commissioners of Patents are absolutely final as to all purely executive questions. He denied that the Secretary of the Interior had any jurisdiction whatever over any questions relating to patents. He showed by the records of the Department that in no instance had an application of this kind ever been granted, even if made, which was doubtful. There was no such appeal established or permitted by the statute, or by the rules and regulations of the Patent Office.

Gen. Butler replied, contending that the Secretary was responsible for a paper which went out under his signature, and that therefore he should direct the action of the Commissioner. In all judicial proceedings relative to a patent, there was an appeal to the Supreme Court of the District of Columbia, but in executive matters none except to the Secretary. He cited from Supreme Court decisions, and the usages of the Patent Office in relation to assignment, to sustain his point. He claimed that the Commissioner had done his client an injustice, which he asked the Secretary to correct. The Commissioner had felt obliged to make his decision upon the facts

shown on the records of the office. He claimed that the records were not sufficient, that the Secretary should go behind the records and admit further evidence.

Mr. Latrobe followed, arguing that the question of novelty or of invention goes to the Supreme Court, while that of ownership goes to the Secretary. He wanted the patent issued to Harrington, according to his contract with Edison.

Mr. Ashton insisted that if the Secretary was to sit as a court of appellate jurisdiction, that he must decide the case upon the record as presented to the Commissioner; that new evidence could not be introduced into the case. The hearing lasted from twelve o'clock until nearly half-past six.

The following is the decision of Secretary Delano:

"It is the practice of the Department to sign without inquiry all patents that are sent up from the Patent Office with signature of the Commissioner attached before they are presented. As far as I know, it has been the practice of the Office from time immemorial; I cannot say to the time whereof the memory of man runneth not to the contrary, etc. My memory only dates back to the day of Secretary Ewing.

"The records of the Department, as has been well asserted by the counsel, show that applications to the Secretary to withhold his signature to these patents have been very rare, if one has ever been made. Nevertheless, I am very clearly of the opinion that when my attention is called to the facts of a case, and my judgment is that a patent should not be issued, it would be my duty to withhold my signature from the patent. But I think good practice requires that my opinion should rest upon the case as presented to the Commissioner, and therefore I should not be inclined, I think, under any circumstances, to direct the introduction of other evidence than that which was before the Commissioner. Certainly in this case, at this stage of it, I should be unwilling to give an order for the taking of testimony for its continuance as the counsel upon one side of the case have asked.

"Now, as to whether, in my judgment, I shall or shall not deem it my duty upon the case, as it is before me, to sign or withhold my signature from the patent, I shall express no opinion. It will, perhaps, be time enough to express an opinion when the papers are presented to me for signature; but, if the counsel will rest the case upon its present argument, when I reach it by the presentation of the patent, I will decide it. If they wish to argue that question farther, at an early day I will hear it, if they agree upon the time. So that, virtually, if I make myself understood, I decline to grant either of the motions that have been submitted to-day: either to dismiss the case or continue it, and allow additional testimony to be taken in it. I recognize the fact that to the Commissioner is entrusted in the first instance, the duty of examining and deciding upon all questions that arise before him in his office, and are presented to him; but I am unable to bring my mind to the conclusion that it would be my duty to sign a patent because in his best judgment he had directed it to be issued, if I, on the evidence in the case as presented to me, should be of the opinion that his conclusions were clearly and distinctly erroneous. I do not say anything about what I should do in a doubtful case.

"I do not desire to express any opinion at present in any other terms than those I have used, namely, that if the facts in the case, as represented by the record sent by the Commissioner to me, should satisfy me that it was wrong to issue a patent, I cer-

tainly could not conscientiously attach my name to it. I distinctly reserve the expression of an opinion in reference to my convictions as to whether this patent should or should not be issued. I am inclined to think that in no case should I undertake to direct the Commissioner as to his future proceedings after I had determined to withhold my signature from a patent presented."

In conclusion, Secretary Delano notified the counsel of all parties interested that he would allow fifteen days for the preparation of printed arguments on the merits of the case on the record; after which ten days' further time will be allowed to counsel to file replies to each other's briefs.

## WAKE UP THE NIGHT WATCHMAN.

About 10 o'clock last night a young man hurried into the telegraph office and wanted to send a message. It was a matter of the utmost importance, so the young man said, and the message was to go to—say Podunk. The telegrapher explained that there was no night operator at Podunk, and, consequently, the message could not be sent off until morning. That wouldn't do; the message was of the greatest consequence, and it must go right away. The gentlemanly superintendent of the office here took the case in hand and vainly endeavored to make the stranger understand that Podunk was a small station, where there was no telegraph operator except the one in the employ of the railroad company, and he didn't work after an early hour in the evening; but the message would be forwarded the first thing the next day. But no, sir; you couldn't fool that young man. He knew very well that it could go that night, and he would be satisfied with nothing else.

The manager of the office concluded he would hammer the idea into the fellow's head, if possible, so he went over the details of the case again, very fully and minutely, that there might be no mistake. After half an hour of this kind of thing it finally dawned upon the young man that the operator at Podunk was not in the office, but was probably in his little bed, where all good operators go. Then a happy idea struck him, and with much earnestness he said: "Well, if your man ain't there, wake up the night watchman and have him call the operator. That message must go to-night." The telegraph man was astonished at the novel suggestion, and he smilingly began another explanation, to the effect that the night watchman didn't know anything about telegraphy. It wouldn't do. Before the Superintendent got through with his story, the man who wanted to send a message left the office in disgust at all telegraph companies, and swearing vengeance on the Quincy operators. He thinks they are swindling monopolists, who ought to be exterminated.—*Quincy Whig*.

We learn that the Channel Islands telegraph cable, repaired only a few months ago, is again broken. The break is supposed to be nearer to the Guernsey shore than the last one; and it is probable that, owing to the difficulty of obtaining a suitable cable-ship, some little delay may be experienced in carrying out the necessary repairs, if, indeed, it be not found necessary to renew a considerable portion of the cable. Telegrams will, as on former occasions, be conveyed as speedily as possible by the mail steamers from Weymouth and Southampton, and of course the route by way of France is still open for telegrams by wire over the whole distance.



# SOCIETY OF TELEGRAPH ENGINEERS.

INAUGURAL ADDRESS, BY MR. LATIMER CLARK,  
PRESIDENT, JANUARY 13, 1875.

(Continued from page 116.)

I must now take leave of the Electric Telegraph Company, with which I was so long and pleasantly associated, merely recording that its successive engineers were Mr. W. H. Hatcher, Mr. Edwin Clark, Mr. Latimer Clark, Mr. Cromwell F. Varley, and Mr. Richard S. Culley. The Company has now become merged in the Telegraphic Department of Her Majesty's Post-Office, and under the able administration of that department its growth and progress have outstripped the most sanguine calculations.

On the 30th of last June the Post-Office system comprehended 106,730 miles of wire, and 1,451 miles of submarine wire, exclusive of railway companies' wires, and of the Continental and other cables of the various telegraph companies. The number of telegraph offices open to the public on the 31st of December was 5,572, and the number of telegraphic instruments in commercial use was 9,220. The growth of the traffic may be seen from the number of messages, which was as follows:

December, 1871.....	11,760,518
" 1872.....	14,858,020
" 1873.....	17,294,334
" 1874.....	19,116,634

It is gratifying to observe that the consolidation of the telegraphs in a government system has in no way tended to retard the progress of telegraphy, or to discourage invention. Although the able officers of the government must have been at times hardly taxed to meet the growing requirements of the service and the difficulties incident to the transfer of a vast network of rival telegraphs, and their consolidation in one centralized system, they have been throughout among the foremost to seize upon every scientific invention or idea, and to test its practical adaptability to the wants of their system.

I could have wished to have touched further upon the history of the other telegraph companies, to have spoken of the introduction of the pneumatic system, of the various automatic and type-printing telegraphs, of the duplex system, and of the exquisitely scientific instruments of our retiring President, Sir William Thomson; also of the history and development of submarine telegraphs, of underground wires and the progress of telegraphy in other countries; but time forbids, and I must reserve space for a few words about ourselves.

I believe the present Society owes its existence chiefly to the wisdom and energy of Major Frank Bolton and Major Webber, R. E., who foresaw the probable success of the institution, and the benefits which it would confer on all engaged in telegraphic practice or electrical research. As we are all aware, it has been warmly supported by the profession both at home and in foreign countries, and, what is still more gratifying, our list of members comprises the names of some of the most eminent scientific men of the age, and of many who are entirely unconnected with telegraphy. I should like to see this division of our forces greatly extended.

I remark with pleasure that several of our great submarine telegraph companies have given us cordial support, and their officers, who are so exceptionally well circumstanced for making observations of the highest value, have contributed admirable papers to our *Transactions*. We have also been fortunate in receiving the valuable coöperation of the department of Royal Engineers, and many of our best papers have emanated from that highly scientific body.

Our *Journal* continues to maintain its character. It has now reached its seventh number, and is becoming a work of considerable historic and scientific value.

Our example is beginning to be followed in other countries, and already an American Electrical Society has been constituted in Chicago.

The present number of our members is 650.

I will not occupy your time by giving a list of the telegraphic works which have been executed during the past year, since they are well known to most of us, and are abundantly recorded elsewhere. But I will refer to a few of the more interesting novelties which have recently occupied our attention. Among these, I give the first place to the re-introduction of the Bain system of telegraphing by punched paper and chemical decomposition, to which I have alluded in the earlier part of my discourse—if the promises which this system appears to hold out are realized, it will have a powerful influence on telegraphy.

The next discovery I would notice is that of Mr. Edison, of Newark, U.S., who has made the interesting observation that when an electric current traverses a strip of paper moistened with certain solutions it acquires an extremely slippery surface, and taking advantage of this, he has constructed an instrument which may hereafter prove of much value in telegraphy.

Mr. Elisha Gray of Chicago has turned his attention to the transmission of signals by sound—he has exhibited instruments by which musical sounds and even chords are perfectly transmitted over telegraphic wires, and by his latest researches he finds that seven or eight or more different sounds can be all transmitted simultaneously over one wire, and, by springs vibrating in unison with the several notes, can be separated at the end. He is now engaged in applying this principle to telegraphy with prospects of success.

M. Clamond of Paris has so improved the well-known thermo-electro pile as to render it probable that it may to a great extent supersede the use of the ordinary voltaic battery.

The duplex system, now so well known, has been also re-introduced from America, and I allude to it here, not only to point out the activity of thought and invention that is now going on in America and on the continent, but to show how much remains to be done by original research and experiment, and how desirable it is that we should reinvestigate, with the aid of the improved knowledge and appliances we now possess, the inventions and ideas of our predecessors. A boundless field now lies open to research, and I trust before long this Society may be in a position to offer the advantages of a laboratory, of electrical instruments, and of artificial lines and cables, to any of its members who may desire to prosecute fresh researches.

I have no doubt the most interesting and gratifying part of my address will be the announcement I am able to make to you this evening, that the acquisition by this Society of the valuable library of our late lamented member, Sir Francis Ronalds, is now complete. Our sorrow for his loss is tempered by the remembrance that he lived to witness, to an extent perhaps never before vouchsafed to man, the wondrous success and development of that telegraphic system which he had done so much to perfect and to advance in his early life, and by the gratification which we know it afforded him to receive at the hands of his Sovereign a well-deserved recognition of his services to his country.

By his will he bequeathed his library, which it had been the amusement of his life to perfect, to his brother-in-law, Mr. Samuel Carter, of Battle, and this

gentleman, in fulfillment of Sir Francis Ronalds's desire that the library should be made available to all students of electricity, has transferred the whole in trust to this Society, with a reversion to the Royal Society, of which he was so distinguished a fellow, in the event of this Society becoming extinct. The deeds are now before me approved, and only requiring execution. Among other provisions it is stipulated that the collection shall be termed the "Ronalds' Library," and that we shall at once publish the complete catalogue, which it has been the labor of his life to perfect; also, that under due restrictions the library shall, as far as possible, be open to all who desire to consult it, and that we should apply for a charter of incorporation.

I do not yet know the precise extent of the library, but I observe that in a letter of the 29th March, 1870, to the Right Hon. W. E. Gladstone, acknowledging his intimation that Her Majesty had expressed her intention of conferring the honor of knighthood on him, he says "this procedure may tend, in some small measure, to promote my endeavor to complete a much required Electrical Library, of which about 10,000 books and other writings are collected, the fruit of many years' search, and which I intend to bequeath or give to public use."\*

This valuable collection of works will shortly be transferred to our rooms at Broad Sanctuary, and supplemented by the complete copy of the *Transactions of the Royal Society*, recently presented to us by Mr. Louis Crossley, of Halifax, and, by the gifts of others already promised or presented to us, and by our own purchases, it will form one of the most complete special libraries in the world.

I can assure our members they will find the older writers, as well as the more modern ones, well worth their attentive perusal, and full of suggestive thought and experiment. Occasionally they will meet with surprises as regards priority of discovery. Even in my own cursory reading I have been interested to observe that Galvani was not the first to discover the galvanic convulsions of the frog. That that elegant instrument the Peltier electrometer was an English invention of the last century. That Oersted was not the first to observe the influence of the galvanic current on the magnetized needle. That Wheatstone was not the earliest originator of the electric balance, and that Thomson was not the first to use the instrument we familiarly know as the "Mouse Mill," or to perform the beautiful experiment of dropping zinc filings through a copper funnel in order to discover the difference of potential induced by two metals.

There is only one other subject on which I will detain you this evening, and that subject is no other than the constitution of the Society itself.

This Society, as you are well aware, has been modeled on the lines of the parent society—the Institution of Civil Engineers; our rules, our constitution and our proceedings have all been closely copied from theirs. Our object is the general advancement of electrical and telegraphic science, and most fully have the hopes and intentions of the founders of the Society been thus far realized.

As a natural result of our close imitation of the illustrious body in whose rooms we are now assembled, our proceedings and constitution have assumed, in a marked degree, a technical character, and there are those among us, and I confess I am one among the number, who consider that, while giving the highest consideration to practical telegraphy and applied electricity, we shall fail in covering all the ground which rightfully belongs to us, if we do not

\* It is believed that the Catalogue contains a list of about 10,000 works and pamphlets, and that the library consists of about 5,000.

equally cultivate both of the objects of the society, and endeavor to attract the lovers of pure science, and to make ourselves as much an Electrical Society as a Society of Telegraph Engineers. Any one who will revert to the inaugural address of our distinguished first President, and to the observations of those who spoke on that occasion, will perceive that that feeling is a very prevalent one, and one worthy of our attention. It is true that our technical character is, in one sense, a great source of strength, and it has, doubtless, been the means of attracting many members who join our ranks, partly on account of the professional value and interest of our papers, and partly from a feeling of professional *esprit de corps*. It would be most unwise to take any steps which could by possibility weaken this feeling, but at the same time it behooves us to observe that we have not yet enrolled in our ranks, to any great extent, that large body of private scientific workers who love and pursue the science of electricity without any thought of regarding it as a profession. The earliest society of this character—"the London Electrical Society," which was established in 1841, under the able presidency of our distinguished member, Mr. C. V. Walker, F. R. S. and whose proceedings form a valuable contribution to the history of electricity—relied entirely on the support of this class of members; and the rapidly increasing appreciation and love of physical science has caused, and will cause their numbers to increase immensely, and it is among such as these that we may confidently look for the brightest discoveries of electric research. Now, many of these will ask themselves what right have I to consider myself eligible among a Society of Telegraph Engineers, or what affinity have I with them?

The Royal Society will ever attract to itself the most important papers on subjects of high philosophical research, but other societies will certainly arise to fill the electric void if we leave it vacant. Already the want has been felt, and a *Physical Society* has been constituted, which is destined, doubtless, to attract many lovers of pure electrical science, who would willingly join our ranks if the character of our Society were more adapted to their requirements.

It has been suggested that some friendly alliance or amalgamation might be formed with this young but important Society, and if anything of the kind is to be attempted, or any effort is to be made to give our own Society a more purely scientific character, it is evident that it should be done soon or not at all. Possessed of these views, I have gladly welcomed a proposition that I should become a member of the Council of the "Physical Society," and should I be elected to that office, would use my best efforts for the harmony and welfare of both Societies. It is probable that this important question will be again brought under your notice, but in the meantime I have thought it of sufficient interest to address you upon it from the chair.

I have now, gentlemen, to thank you for the patience with which you have listened to my remarks, and to ask you all to lend your earnest assistance and coöperation throughout the year in endeavoring to increase the influence and prosperity of the Society of Telegraph Engineers.

At the main office in London, twenty thousand cells of battery are in use.

The traffic receipts of the Direct Spanish Telegraph Company for February were £1,104, against £1,654 in January. The Lizard and Santander cable was interrupted during the whole of February.

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Cincinnati, Ohio,	Portland, Me.,
Columbus, Ohio,	Peoria, Ill.,
Cambridge, Mass.,	Providence, R. I.,
Charlestown, Mass.	Quebec, L. I.,
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Detroit, Mich.,	Richmond, Va.,
Dayton, Ohio,	Indianapolis, Ind.,
Elizabeth, N. J.,	St. Louis, Mo.,
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Fitchburg, Mass.,	Springfield, Mass.,
Hartford, Conn.,	San Francisco, Cal.,
Jersey City, N. J.,	Savannah, Ga.,
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Mobile, Ala.,	Toledo, Ohio,
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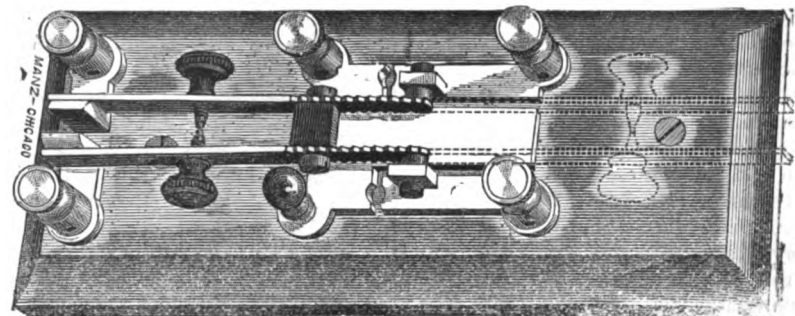
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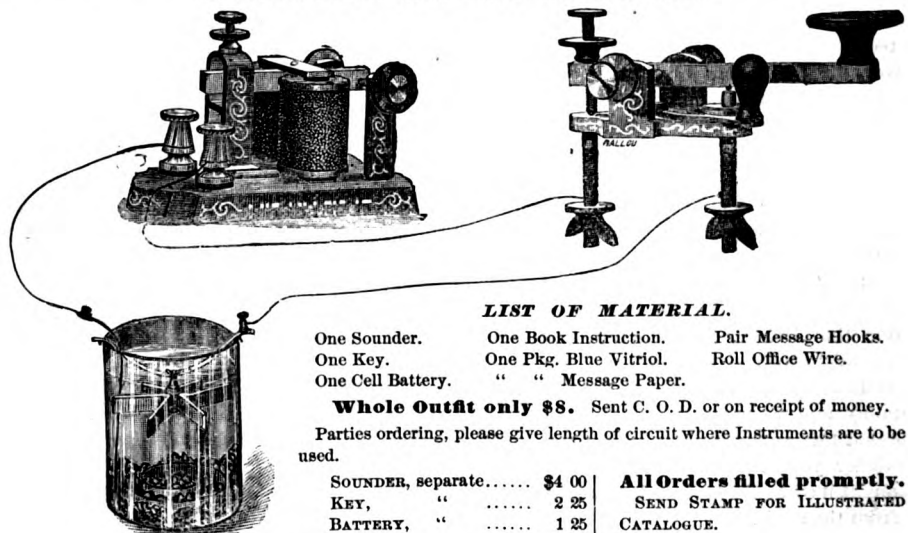
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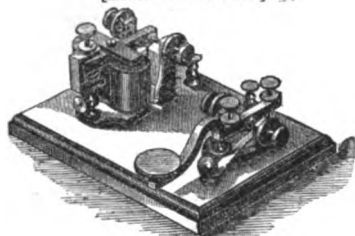
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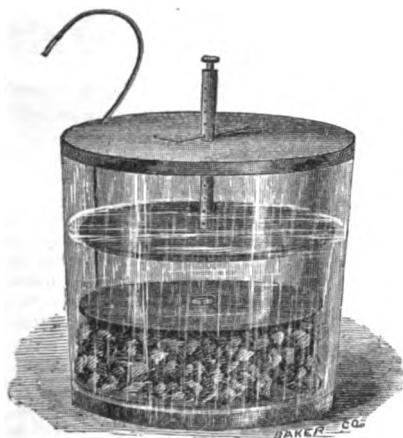
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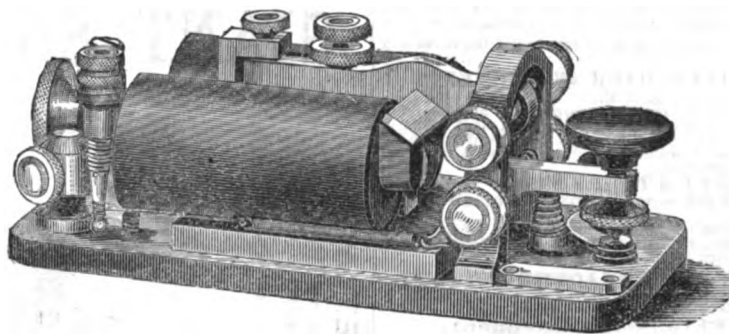
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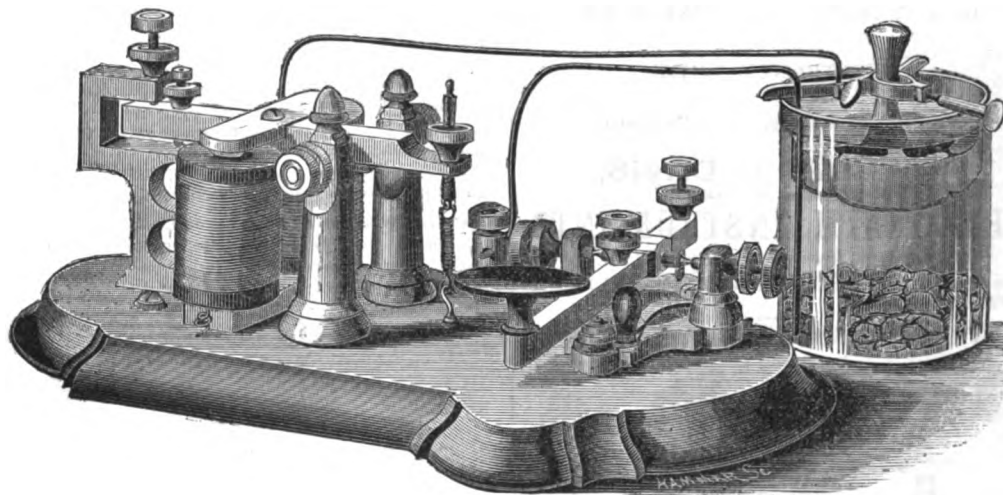
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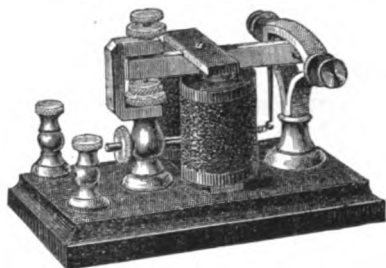
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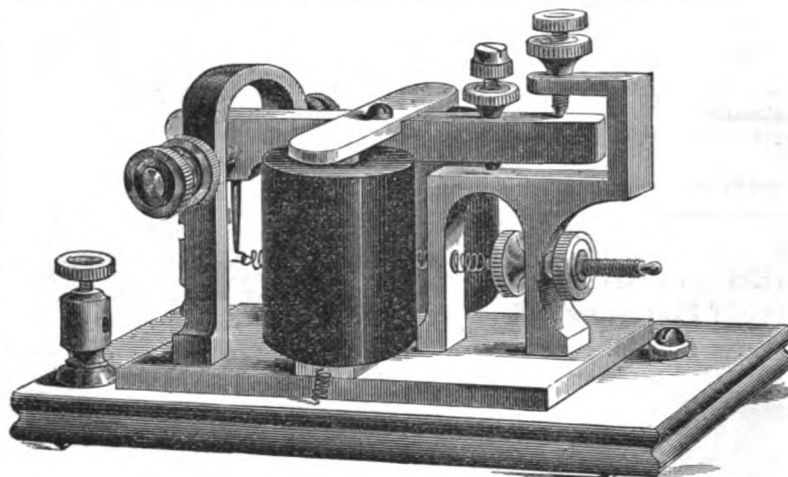
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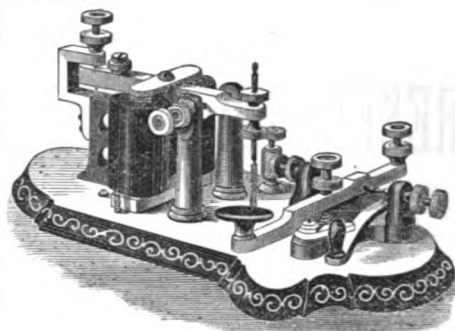
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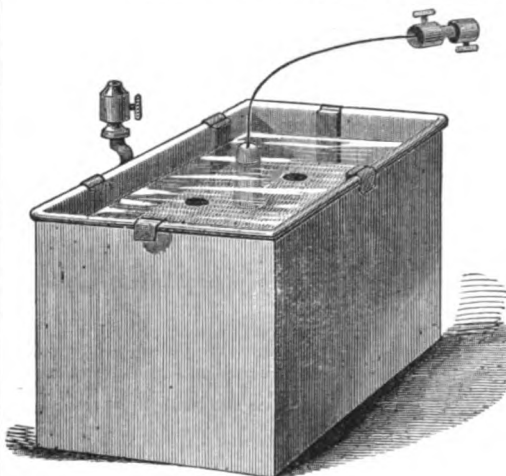
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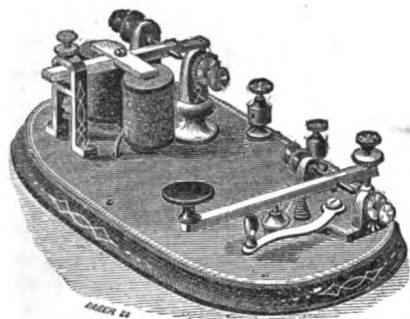
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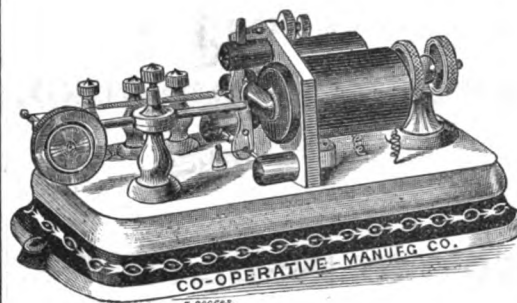
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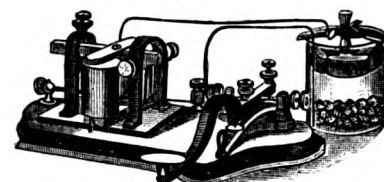
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This Holder is intended to save the last half or third of the pencil.

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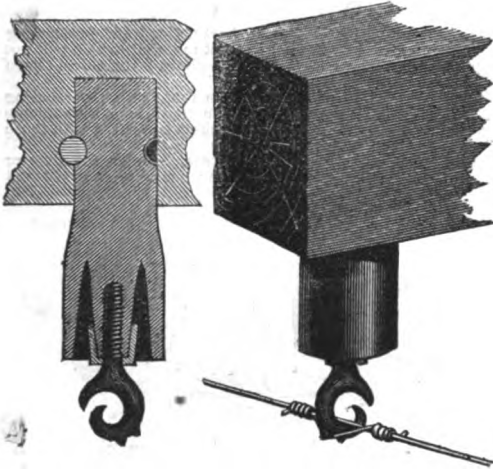
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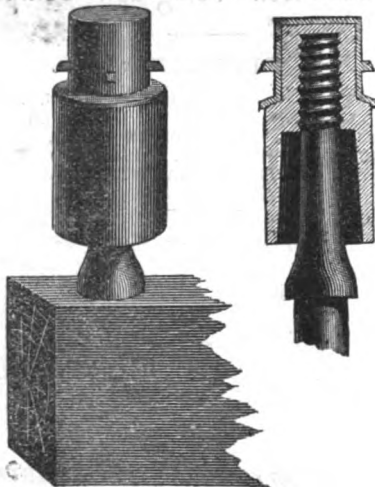
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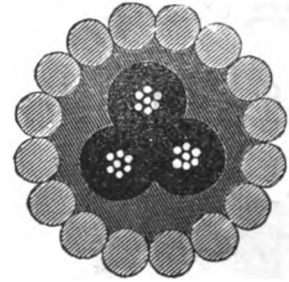
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# JOURNAL OF THE TELEGRAPH.

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WHOLE NO. 181.

## THE CONSTANT BATTERIES.

In the simple combination of zinc and copper with a moist conductor, described in our last issue, we saw that owing to the decomposition of the water, oxide of zinc and hydrogen gas was immediately formed round the copper plate, by which the negative plate became polarized and the current weakened. If instead of pure water we use a mixture of water and sulphuric acid as a conductor, a similar analysis of water occurs, but the oxide of zinc combines with the not so easily decomposable sulphuric acid, and forms a sulphate of zinc, which is dissolved by the remainder of the fluid. In this way the metallic surface of the zinc is kept clean, so long as there is sufficient water to decompose the sulphate of zinc which has formed there. The injurious effect of the hydrogen, however, which surrounds the copper plate, and prevents the direct contact of its surface with the fluid, still remains; the only thing that can be done to remove it is to surround the negative metal (the copper plate) with a material that readily absorbs the approaching hydrogen, and thus prevents its adhering to the metal. As the hydrogen at the moment of its separation readily unites with oxygen, the copper plate is surrounded with a material abundant in oxygen, which then transfers a portion of the oxygen to the hydrogen which the current has separated, and causes a re-combination of both gases into water. Hence the negative metal remains unchangeably in a pure contact with the fluid, and as this is also the case with the positive metal (the zinc) the action of such a galvanic combination remains constant, until either the sulphate of zinc is no longer soluble and the zinc plate becomes covered by it, or the oxygenous material around the copper plate is decomposed.

Daniell was the first to construct batteries of this kind. Subsequently, Grove, Bunsen, Siemens, Meidinger and others also contributed to the production of constant batteries of great value. In order that the oxygenous material which surrounds the negative metal (copper, platina, carbon, iron and others) may not mix with the other fluid which surrounds the zinc, all of these batteries require two cells. The zinc always remains in acidulated water, and the electro-negative metal in the oxygenous fluid, which is separated from the former by means of a bladder or a porous cell or partition, insuring a conducting connection with it.

The Daniell element consists in its present form, as represented in Fig. 1, of a vessel, in which stands a porous clay cylinder *t*. The latter is surrounded by a zinc cylinder *s*, whilst in the clay cell *t* a thin sheet of copper is suspended, which is attached to the copper wire *a*, connected with the zinc cylinder of the next element. At the upper part of the copper sheet *O* a sieve-like perforated copper plate *D* is attached, which serves the purpose of holding the sulphate of copper crystals.

In order to charge the Daniell battery the glass vessel and the porous cup of each element is to be filled with water, and crystals of sulphate of copper put on the copper plate *D*. In about an hour after-

wards enough sulphate of copper will have been dissolved to put the battery in action. As soon as the circuit is closed, owing to the decomposing process which sets in simultaneously with the

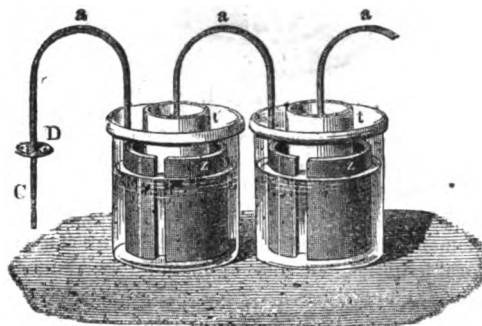


Fig. 1.

current, sulphate of zinc is formed in the zinc cup, which is decomposed by the water in the cup. The released hydrogen, however, is conducted towards the copper plate in the porous cup, where at the

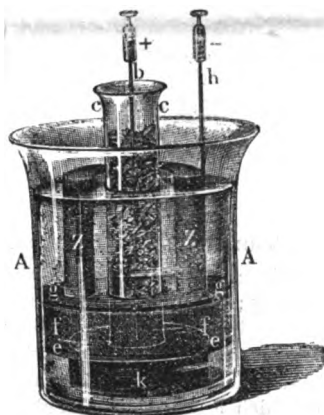


Fig. 2.

same time a corresponding portion of the sulphate of copper is thrown down in sulphuric acid and the black oxide of copper; the former remains undecomposed, and the latter becomes separated into

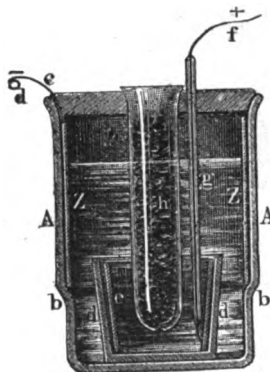


Fig. 3.

copper and oxygen. The oxygen which is released from the black oxide of copper and hastens towards the zinc plate meets the hydrogen which starts from the zinc cup; both gases combine form-

ing water, and the formation of a hydrogen gas around the copper cylinder is thereby prevented. The pure copper which is left from the oxide of copper after the secretion of the oxygen is conducted by the current to the copper cylinders, where it is deposited in a coherent mass.

The maintenance of the Daniell battery is very easy, requiring only the occasional dropping of new crystals of sulphate of copper in the porous cups, in order to keep the solution at the point of saturation, and an occasional change of the water.

The construction of a Daniell element permits of a variety of different forms. Both vessels may be interchanged; the glass vessel may be filled with sulphate of copper, and the porous cell contain the zinc; and in order that the action of the battery may commence at once, the copper cups may be filled with a concentrated solution of sulphate of copper and the zinc cells with acidulated water.

The Daniell battery is scentless, and does not develop any poisonous vapors, and hence may be used anywhere without fear of endangering health or acting disadvantageously on the metallic parts of the surrounding apparatus.

It is especially adapted to telegraphic apparatus worked upon the closed circuit plan, but less suitable for open circuits, because in the latter case a good deal of metallic copper is formed at the bottom of the porous cups, by which the cups themselves become spoiled and the current is weakened.

But even in a closed circuit the porous cups of a Daniell battery, when used for a long time, are apt to be covered with copper on the side turned towards the copper plate which often penetrates through the cells, and makes them brittle; and on account of a conducting connection by some solitary thread between the zinc and the copper plate, the activity of the respective elements is very considerably retarded. Contrary to the general opinion that these deposits of copper are produced by the circulating current, and tend to increase the strength of the battery it has been proved that they have nothing to do with its activity. For several days a powerful current may be kept up without any visible mark of this copper coating being noticed on the cups, whilst on the other hand, in a few days on an open circuit, 10 to 30 grains of coating may be obtained, if the battery is filled with the fluid in the usual way, but no copper or zinc cylinder is put in, there will be no visible coating of the cups; hence it does not originate through an action of both fluids on each other. Neither does it appear when the copper cylinder only is inserted; it appears, however, after the zinc plate is put in, it being thus obvious that this is substantially required.

It is a well known fact that iron put in a solution of sulphate of copper precipitates the metallic copper. Dip a small piece of iron, even for a short time, into a solution of sulphate of copper and it will become red, and closely coated with metallic copper. Now all the zinc of commerce contains, besides other metals, iron, which, as experience teaches,



when mixed with zinc, lead and so forth, cannot be dissolved by diluted sulphuric acid, but coats the zinc with a loose gray stratum, which gradually as a gray deposit falls to the bottom. Likewise by giving an oblique direction to the zinc plate, it will soon be found clinging in larger or smaller quantities to the sides of the porous cells. But as the porous cups, after a time, become impregnated with the sulphate of copper, the latter becomes chemically reduced, so that metallic copper is formed on the porous cups. The first copper stratum that is formed in this way comes in direct contact with the metallic copper deposit, formed in the sulphate of copper solution, and a small Daniell element very soon thickens the copper stratum, which following the thread, penetrates through the porous partition and expands itself outside it in a solid mass. The process of penetration through the porous cell always commences at the side turned towards the zinc, which can be easily shown, for if the cells are filled in the usual way, and some zinc deposit is placed in it equally divided on the sides of the cups, the copper efflorescence on the side of the clay cell which was turned towards the sulphate of copper will not appear until some hours afterwards. The penetration of the copper through the porous cups may be prevented by coating them with wax over the bottom, and on the lower sides about  $\frac{1}{4}$  of an inch high, and removing the zinc deposit every two or three days with a metallic brush. The penetration of the sulphate of copper in the porous cups may be decreased, if the acids are poured in four or five hours previous to the sulphate of copper solution. When the Daniell batteries were formerly used on the Prussian telegraph lines the porous cups were glazed on the outside of the bottom as well as inside.

The great superiority of the Daniell battery for general use led to a series of alterations, all of which were intended to obviate the inconveniences which we have alluded to, and which are connected with the use of a porous cup. We shall describe the more important of them, which are still retained in use.

The Siemens-Halske's element, which is a modification of the Daniell, differs from the latter substantially in the improvements in the diaphragm. It is represented in Fig. 2.

A A is a glass vessel, c c a glass tube, k a perpendicular copper plate bent into spreads, b a wire attached to it, e e a thin pasteboard disk, f f the diaphragm in place of the porous cell formed of a peculiarly prepared mass of paper, Z Z a zinc ring with clamp h. The mass of paper must be well compressed and afterwards a fourth part of its weight of sulphuric acid poured over it and stirred up until the whole mass has become homogeneous and glutinous. Then four times as much water is added to it, and worked with it; the superfluous sour water is removed under pressure.

The inner glass cylinder c c is to be filled with crystals of sulphate of copper and water poured on it, and likewise the ring-shaped intermediate space filled with water, to which is to be added on the first filling some acid or common salt. Afterwards it is only necessary to keep the inner cylinder always filled with crystals of sulphate of copper, and now and then renew the water in the outside vessel. The sulphuric acid required to form the sulphate of zinc is conveyed by the current itself through the diaphragm, and simultaneously removed through it by the sulphuric acid which is set free by the decomposition of the sulphate of copper.

The cost of maintenance of this battery is very small, as all chemical consumption of zinc and copper

is prevented in consequence of there being no local action. It may be left standing for months without impairing its action, if good care is taken that crystals of sulphate of copper are visible in the glass tube c c, and the diluted water replaced. The zinc is not amalgamated. In order to keep the foreign metals contained in the zinc, which are left behind undi-



Fig. 4.

luted, separated from the mass of paper, the latter is covered by a ring g g of coarse cloth, which is replaced by a new one, when the battery is cleaned, which ought to take place every fortnight. These elements have generally too much resistance for local batteries, but they are admirably adapted for working long lines.

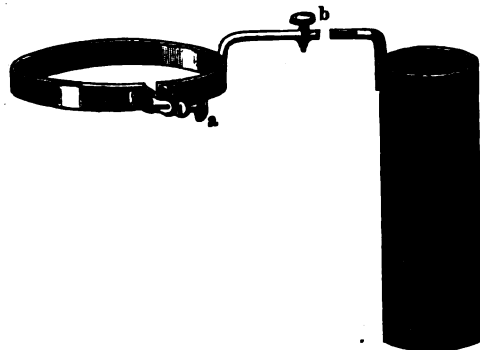


Fig. 5.

#### THE MEIDINGER BATTERY.

The Meidinger element is a modification of the Daniell battery; but it has no porous cell, and possesses greater durability and constancy of current. It consists, as shown in the engraving, of a glass vessel, A A, 8 inches high and 5 inches wide, in the bottom of which is placed a small glass vessel, d d,

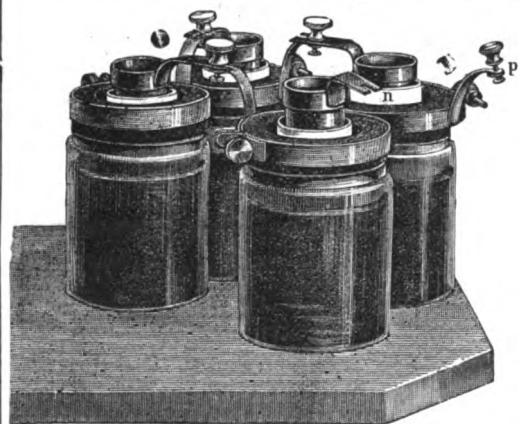


Fig. 6.

of half the dimensions of the larger glass, cemented in with rosin. A zinc disk, Z Z, which is supported upon a ledge of the outside vessel, surrounds the smaller glass. The inside wall of the smaller glass, d d, is covered by a sheet of copper, e, on the lower end of which an insulated copper wire, g, is riveted. The mouth of

the vessel is closed by a wooden or tin plate having an opening in the center for the reception of a glass cylinder, h,  $1\frac{1}{2}$  inches in diameter and 8 inches high, narrowing towards the lower end, which is rounded, and in which a hole is made. This tube is sunk to the center of the small glass, d d. The entire vessel is filled up to the zinc disk, about  $1\frac{1}{2}$  inches below the upper brim, with a diluted solution of Epsom salts. The glass cylinder, k, in place of which a glass funnel can be used, is filled with crystals of sulphate of copper, forming a concentrated solution which, being a heavier fluid, sinks down through the small hole in the glass tube, and fills the small glass, d d, to the center.

There is very little diffusion of the copper solution upwards, or out of the little glass vessel, d d, to the zinc disk, Z, even when the battery is not in operation; so that, after the lapse of several weeks, the zinc scarcely shows any signs of being affected by the copper. The battery is therefore much superior to the ordinary Daniell battery, which, when the circuit is open, produces a great diffusion of the sulphate of copper through the porous cup.

The zinc is usually amalgamated on its inner side, enabling its impurities to be easily removed, which would otherwise form a hard crust. If the copper wire, g f, which is riveted to the copper sheet, e, is connected with a small strip of copper, c k, soldered to the zinc disk, we obtain a galvanic current having an electromotive force equal to that of a Daniell cell and it remains constant as long as there is sulphate of copper in the glass tube, h; and the zinc, Z, is not dissolved. During the activity of the battery, in fact, the solution of sulphate of copper increases a little in quantity, in consequence of a diffusion which is caused by the overflowing (in the smaller glass, d d,) of the heavier sulphate of zinc solution formed by the dissolution of zinc. By the action of the current, the greater part of the copper is deposited on the upper half of the copper plate. A trace of copper, however, appears upon the zinc, but frequently this is after several weeks' operation. The duration of the battery depends on the size of the glass vessel. A battery of the size described (according to Meidinger's statement) ought to be taken to pieces and the solution of Epsom salt and sulphate of zinc drawn off, and pure water put in it as soon as it has consumed 3 lbs. of sulphate of copper, which, however, may take a year.

The resistance of this cell considerably exceeds that of the Daniell battery with porous cells; but for a line battery, where the resistance in the wire is very considerable, this is of no special importance. Meidinger recommends, for main lines, cells 5 inches high and 3 inches wide; while the battery of the size depicted in our engraving is intended for local use and for line batteries of small resistance. As a local battery for the Morse telegraph, it is best to use six cells, two of which are connected with like poles, so that we have, practically, three elements with enlarged surface and conductivity.

Generally, in charging the Meidinger element, a solution of 1 part of Epsom salts to 4 or 5 parts of water may be used. In proportion to the activity of the battery and the consumption of the sulphate of copper, fresh crystals of this salt should be added to the contents of the glass funnel. But when the surface of the fluid has sunk by evaporation, soft water only need be added to the glass funnel. An improvement has been obtained in this element by having the funnel-shaped sulphate of copper vessel entirely closed at the top. After the jar, h, has been charged with crystals of sulphate of copper, a solution of Epsom salts (sulphate of magnesia) is added thereto.

The Meidinger battery is valuable wherever long duration and a current of moderate but constant strength is required, and especially for operating the Morse telegraph, electrical clocks, hotel telegraphs, and electric bells. The chief condition for its successful use is that it shall not be shaken, as shaking causes a mixture of the fluids, and in this way destroys its action and the constancy of the current. Its faults consist in the liability that the tube, *h*, may be filled up with sulphate of copper (either from impurities of the salt or from precipitation of metallic copper) or crystals of sulphate of zinc, so that the action of the element ceases; and partly because the flow of the solution of sulphate of copper from the tube to the lower edge of the zinc cylinder rises, and then, at the least diffusion, the sulphate of copper attacks the zinc. When this happens, the sulphate of copper is decomposed by the zinc, a superfluous quantity of sulphate of zinc is formed in the fluid, and metallic copper is precipitated in the form of a brown, spongy powder upon the zinc cylinder. This battery is extensively used upon the Austrian telegraph lines.

#### BUNSEN'S BATTERY.

The Bunsen zinc carbon element replaces the expensive platina of the Grove battery by a mass of carbon made up in the shape of a hollow cylinder, peculiarly prepared.

Figs. 4 to 8 represent it in its parts and construction.

As will be seen from Fig. 4, a carbon cylinder, open at the bottom, is put in a glass vessel which becomes narrower towards the top; in the hollow of the carbon cylinder, is inserted a hollow, porous clay cylinder, closed at the bottom. A ring *a* is closely laid around the upper part of the carbon cylinder, extending beyond the glass vessel; this ring is attached to the hollow cylinder *c*, made of rolled zinc. Ring *a* is made of copper, and, as Fig. 5 shows, may either be closely fastened to the carbon cylinder at *a*, or by means of the copper cross-bow, and the screw *b* may be coupled to the zinc cylinder at pleasure.

The porous clay cup which stands inside the carbon cylinder is filled with diluted sulphuric acid, and the glass vessel in which the carbon is to be found, with concentrated nitric acid. Zinc cylinder *c* of one of the elements hangs in the porous cup filled with sulphuric acid of the next element. How these separate elements are connected into a battery, is shown in Fig. 6.

The zinc cylinder of the first glass is connected with the copper strip or the carbon cylinder of the second glass, the zinc cylinder of the second glass with the copper strip of the third glass, and so forth. Finally the zinc cylinder of the last glass with its strip *n* projects out of the battery and forms the — pole, just as the copper strip *p* of the first glass forms the + pole. The positive current passes in this battery, in the closing wire, outside the fluid, from carbon to zinc.

J. Stöhrer, of Leipzig, has considerably improved the carbon battery. Fig. 7 gives a view of such an element.

The cylinder, consisting of very solid and compact carbons, has on the top a projecting edge, which rests upon the edge of the glass vessel which surrounds the cylinder, and is provided with a heavy copper ring. This ring does not serve the purpose, as in those formerly constructed, of taking up the current from the carbon cylinder, but it is the mere bearer of a strip *a*, in which is located a binding screw *r*. Opposite to this screw the carbon lays bare, and at *p*<sup>1</sup> the curve is transformed into a plain

surface, in order to present a flat contact to the connecting part of the nearest zinc. The zinc is cross-shaped, a convenient form for casting, and should be properly amalgamated—that is to say, covered with quicksilver. It terminates in a round neck, in which the connecting wire is soldered.

The wire terminates in a heavy copper strip *p*,

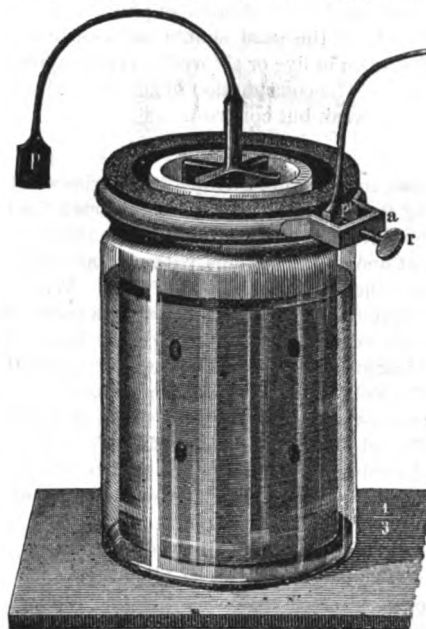


Fig. 7.

which may be covered with platina on the side connected with the carbon cylinder between *p*<sup>1</sup> and *r*<sup>1</sup>.

The projecting edge of the carbon cylinder is soaked in wax, and the ring covered on the inside and outside and cemented with wax and resin, mixed in equal parts. As the plate *p*, covered with platina, takes up the current direct from the carbon, the

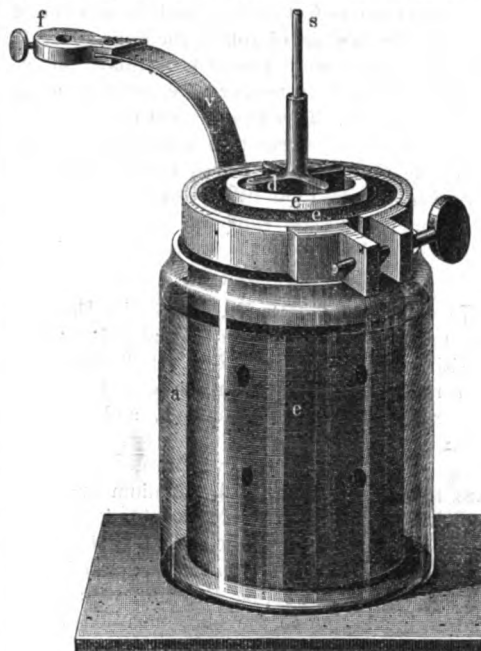


Fig. 8.

main inconvenience of the former carbon batteries, namely, that the copper rings, which serve the purpose of taking up the current, oxidized very quickly, and then made very bad conductors, is obviated.

The Bunsen element develops, like the Grove a very powerful current, but it has the great

disadvantage in common with the latter, that in using it there is evolved a heavy brown gas, peroxide of nitrogen, which is injurious both to the health and to the apparatus, and makes it unfit for general use.

Siemens-Halske zinc carbon element, represented in Fig. 8, is a fair construction of Bunsen's elements. *e* is the carbon cylinder, of 4½ inches high, 2½ inch inside and 3 inches outside diameter; *c* the porous clay cup, of 4½ inches high, and 2 inches outside diameter; *d* the zinc cast in the ordinary cross shape, to which the copper pivot *s* is soldered, which is to be connected with the carbon of the nearest element by means of clamp screw *f*. Around the upper part of the carbon cylinder a leaden ring about ¼ of an inch wide is laid, and around the latter a copper ring of the same width, which is separated and carries on both its ends flanges, which may be moved towards each other by means of a screw, and thus press the leaden ring closer to the carbon cylinder. The copper ring carries the prolongation *v*, on which clamp *f* is attached, by means of which the carbon cylinder is connected with the zinc of the nearest element. The entire system stands in glass *a*, whose form is to be seen from the drawing.

The solutions for this carbon battery for telegraphic purposes consist of sulphuric acid diluted with 15 to 20 parts of water, both for the porous cups holding the zinc, as also outside of them for the carbon cylinder. In both cases the zinc should be amalgamated very carefully.

A Bunsen battery of the latter kind, with diluted sulphuric acid in the zinc as well as copper cell, produces for some time a pretty constant current, if it is not kept closed too long, and hence it is very convenient for a telegraph line, which, when not in operation, leaves the battery open, and for working purposes requires only a momentary close. If, however, they remain closed for some time the carbon cylinder becomes coated with a layer of hydrogen which retards the conduction of the current in the inside of the battery, and even interrupts it.

In such cases the current of the battery is no longer constant. Even on open circuits its strength is soon exhausted, if it is kept in pretty constant action, by the rapid formation of sulphate of zinc. In Prussia, where these batteries were formerly in pretty general use for working telegraph lines, they required to be renewed every five weeks. The carbon cylinders and the porous cups of the old elements require to be soaked in warm water to remove the salts with which they become impregnated.

The carbons for Bunsen's battery are made by a process invented by Bunsen. The fine dust of coke and caking coal is first put into a close iron mould of the shape required for the carbon, and exposed to the heat of a furnace. When taken out, the burned mass is porous and unfit for use, but by repeatedly soaking it in thick syrup, or gas tar, and reheating it, it at length acquires the necessary solidity and conducting power. The carbon that forms on the roof of gas retorts is harder and better than the carbon thus made, but it is difficult to work, and the supply of it is limited.

Marié Davy's quicksilver element is very successfully used in France at the present time. It is a zinc carbon element in which the zinc stands in pure water and the carbons in a paste of moistened proto-sulphate of mercury in a porous cup. The reduction in the inside of the element follows just as with the Daniell element; the zinc becomes oxidized through the oxygen of the decomposed water, and the hydrogen, which is set free, reduces the oxide of mercury which proceeds from the decomposition of the sulphate. Of course the sulphuric acids get over

to the oxide of zinc and form sulphate of zinc, while the hydrogen goes to the oxide of mercury uniting with its oxygen and forming water, and metallic mercury forms on the bottom of the porous cell. According to a French authority 38 elements were in uninterrupted activity for six months without requiring any cleaning or renewing whatever, the current being equal to 60 Daniell elements, while the dimensions were smaller than the Daniell, which, under the same conditions, only lasted three months. The glass vessels were  $3\frac{1}{2}$  inches high,  $2\frac{1}{4}$  inches diameter; the zinc surface was  $2\frac{1}{4}$  inches  $\times$   $2\frac{1}{4}$  inches, and the porous cups  $2\frac{1}{4}$  inches  $\times$   $13\frac{1}{8}$  inches.

In another combination hyposulphuric oxide of mercury is used which is insoluble in water, instead of the soluble muriate of mercury.

The sulphate of mercury is liable to rise by capillary action to the junction of the carbon and copper, and by attacking the copper destroys the continuity of the circuit. This is prevented by filling the pores of the charcoal at the top with melted paraffin.

#### LECLANCHE'S ELEMENT.

The + pole consists of a carbon plate which on its upper end is coated with rosin, and provided with a binding screw; it stands in a porous cup, which is filled with a coarse-grained mixture of peroxide of manganese and carbon, the residue of gas retorts.

The — pole consists of an amalgamated zinc rod; both poles stand in a diluted solution of sal ammonia which is poured into the outside glass vessel.

When the element is closed the current in the zinc cup decomposes the water and the sal ammoniac, and in the carbon cell the manganese. In the zinc cell chloride of zinc is formed, which dissolves; the hydrogen of the decomposed water is neutralized by an equivalent of oxygen, which the manganese gives up; the hydrogen of the chlorine unites with the oxygen of the decomposed water. Hence the zinc, as well as the carbons, always maintain a good conducting connection with the fluid, and consequently the strength of current remains constant for a pretty long time.

Leclanché's element has been employed for the past seven years on several French and Belgian railroads, and is also used elsewhere very successfully for telegraphic purposes, hotel annunciators, and so forth. The internal resistance of the element is hardly  $\frac{1}{4}$ th of that of a mercury element of the same size; while the electromotive force of 28 cells is equal to 40 Daniell elements of the same size.

The alum battery is well designed for operating bells on telegraph lines where, in a state of rest, the line is without any current—the battery being inserted only when the bells are to be rung—because even when inserted in the line 50 to 60 times a day for this purpose, it may stand for half a year without being taken to pieces.

The battery consists of zinc and copper without porous cups, and is filled with a concentrated solution of alum, composed of six pounds of alum to 12 parts of water. In the beginning the glasses are only a little more than half filled, and then every five to six days a little is added to it, so that the fluid in the glasses ascends a little more. Amalgamation of the zinc disks is not required. When the bells, notwithstanding the addition of the fluid, cannot be made to strike, the elements require to be taken entirely to pieces, the zinc well scraped, glass and copper cleansed, and finally everything again put up in due order.

#### THE SAND BATTERY,

which was formerly used in working the Bain telegraph in this country, and even at the present time is used to some extent in England to work the needle

telegraphs, is only suitable for lines which require only an occasional and weak current. It consists of plates of zinc and copper, placed in parallel to each other, in a wooden box covered on the inside with marine glue.

The band is pressed between the metallic plates, and moistened with diluted sulphuric acid. From time to time the sand should be moistened, and usually, once in five or six weeks, taken to pieces and renewed. The consumption of zinc is small, but the current is weak but constant.

#### THE EARTH BATTERY.

Gauss, in repeating Steinheil's experiment of conveying the galvanic current back through the earth, on the Göttingen circuit, provided the termini of the wire at one of the stations with a copper plate, and at the other station with a zinc plate. When these ends were buried in the damp earth, a pretty strong galvanic current passed through the line. Such a combination was evidently nothing more than a simple Voltaic element of large size; the moist stratum of earth—3,000 feet thick—between the metallic plates took the place of the felt disc.

Bain subsequently devised a similar arrangement for obtaining a durable and constant current. By burying a zinc and copper plate in the earth, where there was continual moisture, and connecting them through an isolating wire, he obtained a current of sufficient strength to work his telegraph. By a similar arrangement both Bain and Weare operated their electric clocks. An earth battery of this character will produce a current of small electromotive force until one of the metals becomes oxidized, which experience shows takes place very slowly.

The most extended use of the earth battery was made by Steinheil on the telegraph line erected by him along the railroad from Munich to Nanhofen in 1846, a distance of twenty miles.

The metallic plate in Munich was a sheet of copper of 120 square feet surface, and the metallic plate in Nanhofen a sheet of zinc of the same size. Both metallic plates were placed horizontally in water and connected by a copper wire insulated on poles through the air. This arrangement furnished a continuous galvanic current of sufficient strength to work the electro-magnets used by Steinheil, which, however, required but little power. The earth battery does not possess sufficient electro-motive force to work the Morse or dial telegraph.

#### AMALGAMATION.

In all constant batteries, except the Daniell and its modifications, amalgamated zinc is used as a positive metal—that is, zinc covered with mercury, as it resists the attack of sulphuric acid a great deal better than unamalgamated zinc, and is, besides, more electro-positive than the latter. The zinc of commerce moreover is never pure, but is more or less mixed with iron, lead, cadmium or manganese, which is never dissolved in the circuit by the sulphuric acid, and hence adheres to the zinc cylinder as a hard crust, and soon weakens the electric current unless removed. Coating the zinc with mercury causes, in addition to the above-mentioned advantages, these impurities to be easily removed.

The amalgamation of the zinc is very easily accomplished by dipping the zinc in a vessel filled with mercury, after having first cleaned the zinc by dipping it in a solution of sulphuric acid and water, and rubbing its surface with a brush. The zinc cylinder may be dipped in a deep vessel containing mercury and muriatic acid. The following method is also recommended: Six ounces mercury are dissolved in 80 ounces aqua regia (a mixture of  $7\frac{1}{2}$

ounces nitric acid and  $22\frac{1}{2}$  ounces muriatic acid) after careful heating, and when dissolved 30 ounces muriatic acid are added thereto. If the zinc is dipped in this fluid for a few seconds it will be completely amalgamated, even if much corroded. This plan is easy, safe and inexpensive. The quantity of chloride of mercury above mentioned will amalgamate from 150 to 200 zincs.

Bunsen's or Grove's batteries may be amalgamated by simply pouring a small quantity of mercury into each cell containing the zinc, when the latter will remain coated with mercury, as long as the supply lasts, without further attention.

#### THE TELEGRAPH IN THE AFRICAN DESERTS.

A correspondent of the London *Times*, writing from Berba, in tropical Africa, says:

"It was singular to meet with the telegraph in the heart of the desert between Aryab and Berba; not the telegraph put up in working order, as we see it in Europe, but all the appurtenances of that instrument of civilization carried on the backs of hundreds of camels, which, laden with coils of wire and hollow iron posts, trod their toilsome path through the burning sand. Every now and then we met one of these poor beasts which, overweighted and broken down by the weight of his load, had fallen on the ground and been abandoned a victim to the vultures. All this telegraphic gear was marked 'Siemens Brothers, London,' and was *en route* to Khartoum, from which town it will be forwarded on to span the desert between Kordofan and Darfour. A good many lives will probably be sacrificed before the line can be considered open, as the Arabs, who eagerly steal every piece of iron they can meet with for their spear points, have to be very severely punished before they leave off cutting down the poles. However, this difficulty once got over, the telegraph will be as easily worked as the one between Khartoum and Cairo, which, when it was first laid down, was continually being interrupted."

#### PHOTOGRAPHY OF THE ELECTRIC SPARK.

Mr. Leo Daft, photographer, of Troy, N. Y., has sent the *Scientific American* several photo stereos, recently made, of electric discharges between the terminals of the Holtz static electrical machines. In some of the examples the picture shows the electrical flow divided into ten streams, which have the appearance of ten fine, white, zigzag wires, sharply defined and arranged in the form of an elliptical framework. It is probable that the metals used in the terminals had something to do in giving the remarkable acinic power to the sparks which those photo impressions indicate. Mr. Daft intends to continue his photo-electrical experiments, which are certainly very interesting.

BOLEMAN has recently published an investigation into dielectric absorption. His experiments confirm most of Faraday's well known ideas, and have shown that in all probability the molecules of electrized bodies are themselves polarized, that is to say, are arranged with positive and negative poles respectively in the same directions. In pursuance of a similar train of thought, Streintz, in studying the effect of electricity on its conducting wire, concludes that the latter expands lengthwise more than is due to its heat, and attributes the surplus to the polarization of the particles composing the wire; the elasticity of the wire is, he finds, unchanged; the effect of the electricity on the length of the wire is manifested gradually, like that of heat.



## EASTERN EXTENSION (AUSTRALASIA AND CHINA) TELEGRAPH.

The report of the directors states that the gross earnings for the half year amounted to £110,759 16s. 9d., and after deducting working expenses, cost of repair and maintenance of cables, payment of income-tax, interest on debentures, &c., and carrying forward the sum of £23,926 19s. 1d. from the last year's account, there was a balance of £102,752 1s. 7d. Three interim dividends of  $1\frac{1}{2}$  per cent., aggregating £89,887 10s., had been declared during the year, and there now remained the sum of £72,789 11s. 1d. for appropriation, out of which it was proposed to declare a dividend of 4s. per share, making a total dividend of  $6\frac{1}{2}$  per cent. for the year, and leaving a balance of £32,839 11s. 7d. to carry to the reserve fund.

The Chairman said the total earnings for the half year had been £110,959, and the gross receipts of the year 1874 amounted to £226,512, exceeding those of 1873 by something over £3,000. The comparison of 1873 and 1874 was as follows: The traffic in 1873 was £223,323 12s. 6d.; in 1874, £226,512 16s. 9d.; the increase in traffic was £3,189 4s. 3d.; the total expenses in 1873 were £63,108 3s. 10d.; in 1874, £57,625 9s., the decrease in 1874 being £5,483 14s. 10d., and the net increased profits amounting to £8,672 19s. He moved the adoption of the report.

Baron Emile d'Erlanger seconded the motion.

Mr. Bain stated that he thought the dividend should be increased instead of adding so large an amount to the reserve fund. He moved an amendment that the dividend be 5s. per share, instead of 4s. per share.

Mr. W. Abbott said that no doubt the motion of the honorable proprietor was a little irregular, because the articles of association provided that the dividend should be the amount declared as by the Board. Although it was perhaps natural to desire a better dividend, at the same time he thought he expressed the wishes of all the shareholders of the Company when he stated that they would prefer to place the Company on a really sound and sure basis. [Cheers.] In telegraphic property, of all other property, it was necessary that large reserves should be made, and if they distributed an extra dividend of 2s. 6d. or 5s. a share, the effect would be to impoverish the *corpus* of the Company to a far greater extent than the shareholders would receive any benefit on the slight and spasmodic increase of dividend. [Cheers.] He must say that he perfectly approved of the report, and he was glad to see the reserve fund growing up and the expenses being reduced, and he did not think they could ask more from the Board than to carry out in the future those satisfactory elements of success as in the past. [Hear, hear.] There was one point he was desirous the Chairman should touch upon, and that was with respect to the extension of the line. It appeared that there were some outlying districts which should be tapped for telegraph purposes. There was the large growing colony of New Zealand; there was no cable connecting New Zealand with Australia, but their line went to Melbourne and round by Eastern Australia. There were rumors afloat that a rival company had a valuable concession from the Australian and New Zealand Governments, and he wanted to know whether this company was prepared to take up their proper position; for he was sure, with the names they had on the list of directors, they had the power to bring into the Extension Company all that valuable outlying traffic. [Cheers.]

The chairman replied that Mr. Abbott was perfectly right in regard to the amendment being out of

order. He and his colleagues knew of the importance of the matter referred to by the honorable shareholder, and he believed that if Australia were connected with New Zealand by telegraph it would be done by this Company.

The motion for the adoption of the report was then put and carried.

## CUBA SUBMARINE CABLE.

The report stated that the gross receipts for the half year amounted to £10,787, from which was deducted £1,123, amount of tolls overpaid by connecting companies during the last five years on Spanish Government messages, leaving £9,664. The ordinary expenses had amounted to £2,738. Interest account (being balance of interest incurred in arranging for payments to contractors for new cable while new capital was being called up), £461; making, together, £3,199; leaving a net balance of £6,465; from which, after deducting the debit balance brought from the preceding half year's account (£3,568), there remained £2,897. That sum would be sufficient to pay the accrued dividend on the Ten per Cent. Preference Shares (£1,052), and leave a balance over of £1,845, which the directors recommended be carried to the credit of reserve fund.

The Chairman, in moving the adoption of the foregoing report, called attention to the deviation in the route of the new cable, which, on the last occasion, it was proposed should be carried to Jamaica, so that it would not only duplicate this Company's system, but also effect the duplicate of the system of the West India Company. That arrangement would also have been much better for the system of telegraphs which lay beyond the range of this Company's lines. But when the practical work came to be done, it was discovered that it would interfere with the basis of this Company's existing concession—namely, that it should not be subjected to the condition on which the West India Company hold their concession, that of carrying the Government messages free of charge.

After a long correspondence, the directors had consequently no alternative but to order the cable to be laid to Santiago, as originally proposed. To have laid it to Jamaica under a simple transfer of the West India Company's right, would have had the effect of immediately cutting off a source of income at present amounting to £4,000 per annum, besides subjecting this Company to the obligation of carrying an unlimited number of Government messages free of charge. The process of laying the cable was now being carried out, and he trusted that it would soon be successfully completed. The Chairman next referred to the debit balance which had been brought forward from last year, viz., £3,568, and stated that it was now wholly wiped out. Had it not been for that amount, the directors would have been enabled to declare a good dividend upon the ordinary shares. The balance to the credit of profit and loss account, after defraying all charges, was £1,845, which the directors proposed to carry forward to a reserve fund, the establishment of which was sound policy. The tables which had been issued to the shareholders showed the steady growth of the traffic from month to month. He considered that the results hitherto achieved indicated a prosperous future. For the first three months of this year the number of messages came out as follows, viz.: January, 2,021; February, 2,079; March, 2,686.

Mr. A. F. Lord seconded the motion.

The Chairman, in reply to questions, said that the receipts per month were "estimated" at £1 per message. During the last half-year the average has

been 19s. 10d. per message. The exact revenue returns were calculated every three months.

The motion was adopted, and a dividend at the rate of ten per cent. per annum declared for the preference shares.

**WEST INDIA AND PANAMA.**—The report states that the amount received during the half year ending the 31st of December last on revenue account was £16,263, and the expenses had been £13,337, leaving a balance of £2,926, which was carried to general reserve account. The traffic receipts during that period were larger than in any previous half year, and showed an increase of 45 per cent. over those of the corresponding period of last year. The company's cables had worked without intermission since the last report. An interruption to one of the connecting cables, between Havana and Key West, occurred on the 16th of September and continued until 1st December, 1874, thus stopping for eleven weeks all through telegraphic communication between the West India system and America and Europe. This had a serious effect on the receipts. The Cuba Company had decided to lay the cable from Cienfuegos to Santiago, thus duplicating its part of the system. The section of 140 miles from Santiago to Jamaica belonging to the West India and Panama Company was left unduplicated for the present. The Trinidad St. Croix-Ponce section of new cables was completed on the 25th of March, thus duplicating an important part of the company's system. The St. Croix-St. Thomas cable had also been laid. The directors had purchased the steamship Investigator for £10,500. She would shortly proceed to her station, and would take 100 miles of spare cable for repairing purposes. The company had acquired by the settlement of the sum the whole mileage covered by the India Rubber Company's claim, including the Jamaica-Colon cable, without any further payment. Thus the former capital expenditure of £525,836 on account of the contract with that company now represented a much greater length of cable than heretofore. The balance sheet showed that the capital expenditure was £809,510.

**SUBMARINE CABLE TRUST.**—The report shows that the revenues for the financial year ended 15th ult. amounted to £28,310, and the expenses to £1,695, leaving a balance of £26,615, which has been appropriated in paying the coupons due 15th October last and the 15th instant, in purchasing twenty-nine certificates in October, and in carrying forward the remainder. It is mentioned that no change has been made in the securities held by the trustees since the issue of the last report.

**THE Eastern Telegraph Company** give the following as the average time in transit between London and India, *via* Falmouth, of all outward messages to India, viz.: During week ending 9th April, one hour nineteen minutes; week ending 16th April, one hour twenty-eight minutes.

**THE number of messages forwarded from postal telegraph stations in the United Kingdom** during the week ended April 10, 1875, was 400,383, an increase on the corresponding week last year of 58,154.

**THE total number of messages forwarded from postal telegraph stations in the United Kingdom** during the week ended the 17th of April, 1875, was 402,903, and during the corresponding week of 1874, 370,865, being an increase in the week of 1875 on that of 1874 of 32,038.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, May 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

- Mt. Pleasant, Del., reopened.
- Laurel, Del., reopened.
- Camak, Ga., closed.
- Darien, Ga., other line office, has been reopened; "tariff for other lines" 100 and 9 from Jesup.
- Butler, Ga., closed.
- Redmon, Ill., closed.
- Roselle, Ill., reopened, square 807.
- Viroqua, Iowa, closed.
- Olney, Md., reopened, square 77.
- Sixty-two Mile Siding, Miss., closed.
- The P. O. A. of Ridgeway Station, Mich., has been changed to Lenox P. O.
- Oregon, Mo., reopened.
- Pappillon, Neb., is now an other line office; tariff 35 and 2 from Omaha.
- Edgar, Neb., reopened, square 516.
- Clarkboro, N. J., closed.
- Valley Station, N. J., closed.
- Lake Mohonk, N. Y., reopened.
- Messages addressed to Lake Mohonk, or Lake Mohonk House, New Paltz, N. Y., leave this line at New Paltz. The "tariff for other lines" from the last named place is 25 and 2.
- Blue Ridge, Pa., reopened.
- Spring City, Pa., is now a W. U. office, square 59; check direct.
- Charleston, Tenn., closed.
- Sweetwater, Tenn., closed.
- Lovingston, Va., reopened, square 114.

## NEW OFFICES.

- 304 Faunsdale, Ala.
- 557 Niwot, Col.
- 67 Slaughters, Del.
- \* New Harmony, Ind., 35 and 2 from Mt. Vernon.
- 467 Independence, Ka.
- 234 Silver Creek, Ky.
- 85 Pamlico, Md.
- 52 Morris Plains, N. J.
- 170 Mineral Point, O.
- \* Bonnechere Point, Ont.
- \* Cataract, Ont.
- \* Napanee Mills, Ont.
- \* Haysville, "
- \* Whelansville, "
- 131 Smith's Mills, Pa.; P. O. A., Smithton.
- \* Gould's Landing, Que.
- \* St. Alexander Station, Que.
- \* St. Roch Station, Que.
- 496 Waelder, Texas.
- \* Hamilton, Va., 40 and 3 from Alexandria.
- \* Lewisburg, W. Va., 75 and 5 from Huntington, 50 and 4 from Greenbrier, W. S. Sp.

## SPECIAL OFFICES.

Check Spring City, Pa., same as special rate to Royer's Ford.

WILLIAM ORTON, President.

## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY,

MARCH, 1875.

## APPOINTMENTS.

J. H. Brown, B'way & Dey st.  
E. S. Risdon, " "  
H. P. Ludington, Grand Central Hotel.  
F. A. Coleman, Cosmopolitan Hotel.  
W. J. Calvert, 397 Broadway.  
T. Gregg, Canal street.  
R. F. Murphy, Cot. Exchange.  
E. J. Hamilton, But. & Cheese Exchange.  
W. J. Rowan, Grand Cent. Dep.  
A. A. Lopez, Cosmopolitan Hotel.  
H. G. Mosier, St. Nich. Hotel.  
J. Brennan, Quarantine.  
J. Monks, Allerton's.  
Miss E. Adams, Astoria, L. I.  
R. Bonton, Garden City, "  
J. Berkley, Brooklyn, "  
J. E. Crumpton, Flushing, "  
S. M. Cheshire, " "  
W. S. Cook, Islip, "  
C. W. Duryea, Sayville, "  
W. H. Ellis, Bushwick, "  
W. H. Gunnison, French Mt., N. Y.  
Jno. Goodenough, Merrick, L. I.  
D. S. Herman, Hempstead, "  
H. F. Kenny, Amityville, "  
W. H. Keeler, Hunter's Point, L. I.  
D. M. Sowne, Farmingdale, L. I.  
T. Montgomery, South Oyster Bay, L. I.  
H. R. Muller, Round Lake, N. Y.  
A. E. McAllister, Albany, "  
G. W. McGinness, Jamaica, L. I.  
Miss B. Phillips, Carmansville, N. Y.  
B. Penny, Rockaway, L. I.  
H. J. Quigg, Woodside, "  
E. H. Wheeler, Sheldene, Vt.  
H. E. Chamberlain, Fisherville, N. H.  
P. McMahon, Jonesville, Vt.  
J. W. Crosby, Milford, N. H.  
N. L. Minor, Newbury, Vt.  
F. Randall, South Barton, Vt.  
C. F. Grover, W. R. Junction, Vt.  
A. B. Churchill, Boston, Mass.  
Miss S. T. Wilbur, " "  
Miss A. Wythe, Cambridge, Mass.  
Chas. Marvin, Canaan, Ct.  
W. H. Andrews, Plainville, Ct.  
W. M. Corbett, Springfield, Ms.  
T. J. Morrison, Frederickton, N. B.  
A. Singelfeldt, Davenport, Ia.  
F. V. Moffit, Iowa City, Ia.  
T. F. Baller, Chicago, Ill.  
C. D. Hay, Austin, Tex.  
J. L. Briggs, Central City, Col.  
A. Russell, Galveston, Tex.  
W. Darie, " "  
Gerrens, Lincoln, Neb.  
J. C. De Long, Shreveport, La.  
M. M. Bond, Marshall, Tex.  
A. Brewer, Sedalia, Mo.  
C. E. Berry, St. Louis, Mo.  
J. J. Briggs, " "  
H. S. Dering, " "  
H. G. Jeystra, Illinois town, Ill.  
J. H. Jenkins, Grand Ind. Neb.  
R. Graham, West Pt., Neb.  
C. S. Springer, Dunbar, Pa.  
E. Kramer, Greensboro, Pa.  
C. R. McConnell, Leechburg, Pa.  
J. Hodil, Sligo, Pa.  
W. F. Kerchner, Titusville, Pa.  
T. E. Moreland, Pittsburg, Pa.  
J. F. Cooper, Bay City, Mich.  
E. G. Read, Grand Rapids, "  
O. P. Frary, No. Lansing, Mich.  
C. E. Tweed, Indianapolis, Ind.  
F. Samuels, Richmond, Ind.  
P. J. Foley, Cincinnati, O.  
O. B. Vincent, " "  
Miss B. A. Ould, Canajoharie, N. Y.  
W. P. Munson, Herkimer, N. Y.  
G. F. Clark, Ithaca, N. Y.  
E. Bean, Skaneateles Falls, N. Y.  
C. W. Trice, Concord, N. C.  
J. G. Cooley, Hillsboro, N. C.  
W. F. Harvey, Meherrin, Va.  
P. J. Prate, Polkton, N. C.  
C. Harper, Powhatan, Va.  
C. W. Pollock, Rocky Point, N. C.  
A. J. Shelly, Thomasville, N. C.  
N. E. Bunting, Wilmington, N. C.  
J. C. Giddings, Leighton, Ala.  
G. H. Pendaavis, Ft. Jefferson, Ky.  
C. H. Skelton, Brownsville, Miss.  
C. R. Cole, Danville, Tex.  
W. O. McLean, Trezevant, Ten.  
W. H. Cox, Midway, Ky.  
J. Constantine, Worthville, Ky.  
W. H. Johnson, Johnsonville, Tenn.  
P. J. Tilley, Thomson, Ga.  
R. E. Walker, Charleston, S. C.  
A. L. Cannon, " "  
W. Redus, Grand Bay, Ala.  
T. H. Scott, Barton, Ga.  
Geo. Heidleberg, Warrior, Ala.  
H. Schiebee, Winchester, Miss.  
J. J. McChultry, Marion, "  
J. Herndon, Prairie, "  
W. T. Carter, Beauregard, "  
H. J. Allen, Duckhill, "  
J. B. Roane, Hammond, La.  
H. C. Miller, Jackson, Miss.  
J. C. Gillooley, Kenner, La.  
C. C. Prince, Summit, Miss.  
R. Person, Waterford, Miss.  
J. H. Armstrong, Winona, Miss.  
J. R. Simpson, Baltimore, Md.  
C. J. Barclay, " "  
E. L. Bussard, " "  
J. R. Thomas, " "  
M. Gest, Dean, N. J.  
J. M. Nicholson, Kingston, Pa.  
M. V. Kibbee, New Brunswick.  
J. Haycock, Roselle, N. J.  
L. H. Gavis, Morris Plains, N. J.  
J. C. Sterling, Flushing, L. I.  
Miss A. Scheller, College Point, L. I.  
D. Sullivan, Whitestone, L. I.  
J. K. Shimor, Bay Shore, L. I.  
Miss F. Smith, Oakdale, L. I.  
Jno. Whiteman, Freeport, L. I.  
J. C. Wing, Melrose, L. I.  
E. Wilson, Babylon, L. I.  
E. Wicks, Patchogue, L. I.  
D. S. Wright, Valley Stream, L. I.  
S. Wright, Pearsall's Corner, L. I.

## RESIGNATIONS.

W. H. Baker, B'way & Dey st.  
T. Hagerty, " "  
Miss A. McCoy, " "  
Miss S. Wallace, " "  
C. A. Meyer, " "  
C. F. Stow, " "  
D. Serchart, " "  
G. W. Shire, " "  
S. J. Noble, " "  
J. S. Henry, " "  
W. M. Cook, Canal street.  
G. Keating, Cotton Exchange.  
S. S. Muchmore, 516 Broadway.  
R. McMahon, 8th avenue.  
Miss A. J. Palmer, 6th avenue and 42d street.  
Sam. Simmons, St. Nicholas Hotel.  
V. Brown, French Mountain, N. Y.  
F. Bunce, Round Lake, N. Y.  
Z. De Forrest, Albany, N. Y.  
W. F. Muchmore, Astoria, L. I.  
J. F. Hasbegan, Quarantine, "  
A. C. Wheeler, Sheldon, Vt.  
W. A. Huntress, Fisherville, N. H.  
C. C. Stevens, Jonesville, Vt.  
D. C. Hoyt, Milford, "  
J. H. Newland, Newburgh, N. Y.  
Miss M. F. Brady, Boston, Mass.  
Miss M. A. Whittemore, Cambridge, Mass.  
F. A. Peet, Canaan, Ct.  
J. Mahan, New London, Ct.  
W. A. Sawyer, Plainville, Ct.  
W. Crandall, Davenport, Ia.  
— Sedgewick, Iowa City, "  
W. Harrigan, Chicago, Ill.  
M. H. Morris, Austin, Texas.  
W. B. Kane, Central City, Col.  
E. Dorval, Dallas, Texas.  
C. A. Rains, Galveston, Texas.  
D. W. H. Voorhees, Houston, Texas.  
M. S. Bacon, Houston, Texas.  
J. S. Moore, " "  
D. Campbell, Jefferson, "  
M. Elser, Little Rock, Ark.  
E. Altman, " "  
J. C. De Long, Marshall, Tex.  
H. A. Dsouche, Monroe, La.  
T. W. Singer, Sedalia, Mo.  
A. G. Thompson, St. Louis, Mo.  
M. L. Mason, " "  
B. K. Sanders, Illinois town, "  
M. M. Bond, Shreveport, La.  
A. W. Almy, Grand Island, Neb.  
L. L. Smith, Omaha, "  
F. J. Lynch, West Point, "  
A. Bliss, Dunbar, Pa.  
M. Berry, Greensboro, Pa.  
E. Bunnell, Irwins, Pa.  
J. F. Robertson, Leechburg, Pa.  
J. B. Bryant, Pittsburg, Pa.  
Miss E. A. Houghton, Bay City, Mich.

F. D. Spaulding, Grand Rapids, Mich.  
C. B. Wright, No. Lansing, Mich.  
W. P. Baker, Cincinnati, O.  
N. H. Hunsaker, Columbus, O.  
R. B. Stafford, Canajoharie, N. Y.  
W. E. Savage, Ithaca, N. Y.  
J. F. Morrison, Balt., Md.  
M. Parker, " "  
W. N. McInnis, Kingston, Pa.  
A. Barnett, New Phil., Pa.  
W. L. Hastings, Penningtonville, Pa.  
J. C. Jones, Roselle, N. J.  
J. D. Snowhill, Spottswood, N. J.  
Frank Jones, Washington, D. C.  
E. D. Morton, " "  
S. S. Carter, Concord, N. C.  
M. T. Kendall, Polkton, N. C.  
E. O. Fitzgerald, Powhattan, Va.  
C. A. Rains, Reidsville, N. C.  
T. S. Hodges, Rocky Point, N. C.  
R. W. Andrews, Wilmington, N. C.  
W. E. Nelson, Ft. Jefferson, Ky.  
J. W. Jordon, Brownsville, Miss.  
N. McLean, Danville, Tenn.  
A. G. Love, Trezevant, Tenn.  
R. J. Eddins, Midway, Ky.  
B. F. Plison, Worthville, Ky.  
S. J. Arnold, Johnsonville, Tenn.  
— Callum, Thompson, Ga.  
C. H. Williams, Pine Bloom, Ga.  
J. S. Horn, Charleston, S. C.  
T. E. Jones, Hogsansville, Ga.  
J. F. Cooper, Coopers, Ala.  
J. A. Carney, Oxford, Ala.  
W. P. Savage, Oxmoor, Ala.  
J. E. Adams, Milner, Ga.  
J. O. Nix, Fairburn, Ga.  
— Moncrieff, Warrior, Ala.  
H. Schiebee, Waynesboro, Miss.  
— Lowry, Marion, Miss.  
— Howell, Prairie, "  
G. B. Pendaavis, Duck Hill, Miss.  
Geo. Alexander, Durant, Miss.  
H. J. Allen, Hammond, La.  
T. J. Kavanagh, Jackson, Miss.  
Geo. Lennox, Kenner, La.  
G. B. Flint, Summit, Miss.  
G. B. Ford, Waterford, Miss.  
W. M. Redding, Winona, Miss.

## TRANSFERS.

Name.	From.	To.
Carrie Brevier	Broadway & Dey	6th av. & 42d st
W. C. Burke	Broadway & Dey	Brooklyn.
J. R. Dennis	134 Pearl street	50 Pine street.
S. S. Eddy	Grand Central Hotel	145 Broadway.
B. C. Havens	Long Branch	Ocean Grove.
C. H. Jennings	50 Pine street	134 Pearl street.
F. Jensen	Thompkinsville	Quarantine.
L. Kirschbaum	Pier 41, N. R.	Fulton Market.
P. Keegan, Jr.	Quarantine	Thompkinsville.
J. R. Knapp	Board of Brokers	14 Broad street.
S. W. Varney	Brooklyn, L. I.	Broadway & Dey.
J. W. Wiley	Jetersville, Va.	Reidsville, N. C.
R. B. Warriner	Meherrin, Va.	Jetersville, Va.
C. W. Trice	Thomasville, N. C.	Concord, N. C.
S. B. Fielding	Thomson, Ga.	Canak, Ga.
T. F. Henslee	Beauregard, Miss.	Jackson, Miss.

THE Western Union Telegraph Company has \$4,448,900 bonds which mature November 1, 1875. To meet these bonds it has been deemed good policy to issue a new 6 per cent. gold 25 year loan for \$4,000,000 rather than to provide for their redemption out of current earnings and the sale of the Company's assets, as might be necessary. In its assets are included \$7,287,735 of its own stock, \$1,038,400 of the International Ocean Telegraph Company's stock, and \$1,173,500 of the Gold and Stock Telegraph Company's stock. For this \$4,000,000 new loan, Messrs. Morton, Bliss & Co. invite proposals, which may be filed up to noon of May 25. Subscriptions will become binding as soon as they reach the amount of \$2,000,000, and if they exceed the total of \$4,000,000, the \$2,000,000 first subscribed will be allotted in full and the remainder pro rata. No bids will be considered below 97½ and accrued interest. As showing the value of these securities, it may be cited that the entire annual interest obligations of the Company amount, including interest on these bonds, to \$405,000 in gold, while the net profits last year, out of total earnings of \$9,530,749, were \$3,076,660. Payments on account of subscriptions to the new 25 year 6 per cents. will be due June 1, and the currency bonds of the Company due November 1, 1875, will be received at the rate of 100½ and accrued interest.

THE shareholders of the American Atlantic Telegraph Cable Company met on May 4th at No. 35 Wall street to elect Directors and transact other business in reference to contracts, etc. The following ticket was reelected: Arthur F. Wilmart, President; Edward Haight, Treasurer; Lucien Birdseye, S. C. Pomeroy, W. S. Worl, Willis Gaylord and James N. Worl, Directors; William O. Stoddard, Secretary.

SOME experiments have been made at Cherbourg with a new railway signal. It has an apparatus which enables a passenger by pulling a cord to light a brilliant electric lamp on the locomotive drawing the train by which he is traveling.

THE San Diego (Cal.) Daily Union says a despatch was sent from Tucson, Arizona, to Washington City, at ten minutes past 7 o'clock last evening, and the answer was returned to Tucson at five minutes before 8 o'clock. Distance over four thousand miles each way. There may be a bigger telegraphic feat than this on record, but this will do to make a note of.

## LADYGENE'S ELECTRIC LIGHT.

The new electric light discovered by M. Ladygene, already described in the JOURNAL OF THE TELEGRAPH, has been deemed of such importance by the Russian Academy of Science that they have awarded him the Lomonosow Prize.

## WEATHER REPORTS.

## THE ORIGIN OF THE PRESENT SYSTEM.

A writer in the *Cincinnati Commercial*, in the course of a long review of the origin of the system of weather reports, claims for the Cincinnati men of the Western Union Company the credit of inaugurating the system in its present state of perfection. He quotes largely from a paper by Cleveland Abbe, A. M., in the *American Journal of Science and Arts*, August, 1871, and after bringing the history of the subject down to 1868, goes on to say:

For some eighteen months previous to this, however, the "repeating offices" of the Western Union Telegraph Company had been in the habit of interchanging reports of the weather at their several stations for their own benefit, and these reports were published in the papers and bulletined in the offices at New York, Chicago, Baltimore, Philadelphia, Washington, St. Louis, Cincinnati, &c. During the Summer of 1868 Professor Abbe entered into correspondence with Mr. George T. Williams, Superintendent of the Western Union Telegraph Company at Cincinnati, and through General Anson Stager, General Superintendent of the Central Division, telegraph reports of the weather were sent to the Professor at Cincinnati, and on September 1, 1869, the "weather report of the Cincinnati Observatory" began. At first reports were received from ten offices only, but was gradually increased to thirty. These reports were written on manifold paper and bulletined in the Chamber of Commerce, Post-Office, offices of the daily papers and telegraph office, and during the months of September, October and November, 1869, the Cincinnati Chamber of Commerce bore the expense of collecting the reports.

A few days after these reports begun to arrive, the writer of this, while making out the lists, heard the Professor predict the weather for twenty-four hours ahead, and not long after for two and three days, with considerable success. One day, while waiting in Mr. Williams' office for the reports to be written out, he showed a copy of a French map of the weather, and mentioned that a map on that plan would be a great help in predicting the weather. Among those present was William Wiley Smith, who at that time was Vice-President of the Indianapolis, Cincinnati and Lafayette Railroad, and who offered to furnish something he thought would assist, and a day or two afterwards there was sent to the office a sheet of brass about eighteen inches square, and pasted on it was a map of the United States, east of the Rocky Mountains and San Antonio, Texas, with holes punched through it at the principal cities from which reports were received. Mr. F. A. Armstrong, the manager of the Western Union Telegraph Company, immediately had a set of dies made, one with a smooth face for cloudy weather, a circle for clear weather, one with an arrow for noting the direction of the wind, and a set of figures for the readings of the thermometer. The manner of making out the maps was as follows: A sheet of common white paper, such as newspapers are printed on, was laid on a table, a sheet of carbon paper placed over that, and then alternate white and black sheets until ten or twelve white sheets had been laid down; on these was placed the sheet of brass, and through the holes the "clear" or "cloudy" weather was imprinted by pounding the dies with a mallet. After the reports were all in the brass was removed, and the figures representing the thermometer were stamped on, the direction of the wind, if any, and finally the names of the stations written on, and the date. Requests for copies of the map increased, and this laborious method had to be gone

through with two, three, and at last four times, to supply the demand. To lighten the labor a map was lithographed on thin paper, so more copies could be made at a time, but the dies, figures and mallet continued in use.

I find the following in Professor Abbe's paper first referred to:

"In February, 1870, Mr. Armstrong, the enterprising manager of the Western Union Telegraph Company in Cincinnati, undertook the daily publication of a weather map for the United States, and this added very much to the value of and interest in these reports. Copies of this map were sent regularly to the telegraph offices in Chicago, New York and elsewhere, everywhere meeting with favor. In May, 1870, the publication of both bulletin and map was undertaken, and continued to be issued until in December, when the entire service was relinquished in view of the daily publication of the Army Signal Office."

The sheet of brass which was used to make out the first weather maps at Cincinnati is now at Washington, either at the Smithsonian Institution or the office of the Chief Signal Officer.

October 1, 1870, the Government commenced the publication of bulletins of the weather reports tri-daily. In December it took the map used by Mr. Armstrong and his associates in Cincinnati, using manifold as they had done, but instead of dies and mallet, a press with adjustable type, and in February, 1871, the lithographed map, such as is now used.

RECENT IMPROVEMENTS IN ELECTRO-MAGNETIC MACHINES.—*M. Z. T. Gramme*.—The author announces that he has constructed one machine for the electric light, two for galvano-plastic, and some small machines for scientific demonstration. The machines for demonstration can heat to redness 0.10 metre of platinum wire of 3.10th millimetre in diameter. Those at present made in the workshops of M. Breguet, and in the author's own, reduce 0.40 metre of the same wire (i.e., four times more than the former) without any variation, either in the weight of the material or in labor. This increase in the intensity of the current is mainly due to the new foliated magnets of M. Jamin. One of the galvano-plastic machines has been working for two years, to the entire satisfaction of the purchasers. It has required no repairs, and no outlay beyond greasing the axle. Some of the author's machines deposit 0.6 kilo. of silver hourly. The new galvano-plastic machines have only one central ring in place of two bars of electro-magnets in place of four. Like its predecessors it deposits 0.6 kilo. of silver hourly, but the force required for its motion is only 50 in place of 75 kilogrammetres. It requires less space by one-half; its gross weight is reduced three-fourths; the copper required in its construction is also reduced three-fourths, and it economizes 30 per cent. of motive power.

EXPERIMENTS ON THE ARTIFICIAL IMITATION OF NATIVE MAGNETO-POLAR PLATINUM.—*M. Daubree*.—It is well known that certain specimens of native platinum not only act upon the magnetic needle, but are themselves polar in the manner of true magnets. These native platinum magnets, according to M. de Koksharrow, are capable of withdrawing a considerable quantity of ferruginous grains from the auriferous sand of the Ural after an ordinary loadstone ceases to have any effect. A similar magneto-polar platinum was produced by fusing the metal with a small quantity of iron.

## AMERICAN ELECTRICAL SOCIETY.

At the regular monthly meeting of the American Electrical Society at Chicago, on Wednesday evening, April 21st, Gray's Telephone was the principal subject of discussion. The inventor, Mr. Elisha Gray, was present, and minutely explained the principle of his invention, and gave a number of practical illustrations of its action.

## OBITUARY.

## WILLIAM C. CHAPMAN.

On Friday, April 30th, died in Brooklyn, N. Y., of consumption, Mr. William C. Chapman, formerly Stock clerk of the Western Union Telegraph Co., and for the last year or two performing similar duties in the Union Trust Company of New York. He was the third son of Edward Chapman, Esq., formerly Auditor of the W. Union Company, and now connected with the Treasurer's department—a young man of fine ability, with social qualities and accomplishments of such an order as to win the respect and admiration of all who knew him. The departed was connected quite early in life with the Central telegraph office of the New York, Albany and Buffalo Telegraph Co. in Utica, N. Y., where his father was for many years the Treasurer, and in every position held by him secured the regard and confidence of his superiors. During his illness his associates cheerfully performed his duties, and thus secured his salary to the last. It was a touching tribute to a comrade who was worthy of it. He was buried in Utica, N. Y., May 3d, and the funeral was attended by a numerous concourse of relatives and friends, who sincerely mourned the loss of a young man to whom life seemed so full of promise, and who was so universally esteemed and loved.

## BORN.

BASLER.—To F. E. Basler, Manager of the W. U. Office at Sullivan, Indiana, April 1st, 1875, a son.

EBY.—At Weatherly, Pa., May 7, 1875, to S. G. Eby, manager W. U. Tel. Office, a daughter.

WORRELL.—At East Toledo, O., April 30, 1875, to W. C. Worrell, operator Toledo Stock Yards, a daughter.

## MARRIED.

DETWILER-ADAMS.—At Keokuk, Iowa, April 18th, by Rev. Mr. Bland, Mr. C. S. Detwiler, Manager W. U. Tel. Co., Bonaparte, to Miss Theresa H. Adams, Chicago, Ill.

PERROW-MALONEY.—At the residence of the bride's parents, Sullivan, Indiana, April 2d, 1875, Geo. L. Perrow, of the W. U. Office, to Miss Maloney, all of Sullivan, Indiana.

GRAY-COGGSWELL.—At Canaan, Conn., April 23, 1875, F. S. Gray, manager W. U. Tel. Office, Sheffield, Mass., to Miss Libbie A. Coggsowell, of Canaan.

## DIED.

CAMPBELL.—At Augusta, Ga., May 2, 1875, of consumption, P. F. Campbell, for many years operator and cashier of the W. U. Tel. Office.

HELMS.—At Thomasville, Ga., April 30, 1875, J. B. Helms, manager W. U. Tel. Office.

M. A. TREVE, referring to the discovery of De la Rive, that if in Ruhmkorff's great electro-magnet the current is closed between the two poles there is neither spark nor sound, but on opening it there is a detonation almost like a pistol shot, the author states that the phenomenon announced by De la Rive is equally produced in the sphere of attraction of either pole; that it is not inherent in an inductor current alone, but that the current of any independent battery, interrupted in this sphere of attraction gives rise to the same effects, and that the extra current augments the tension really and considerably.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

### TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, MAY 15, 1875.

MONSIGNOR Roncetti, *Ablégat Apostolique*, and Prof. Ubaldo Ubaldi, of Rome, Italy, the bearers of the scarlet cap to Cardinal McCleskey, accompanied by the Very Rev. J. O'Connor and the Rev. Edward McGlynn, visited the Western Union Building on Wednesday last, and were shown through the various departments.

NOTHING yet from the *Paraday*. She has been out forty days to-day.

AN entire change in the management of the operating department of the Chicago office of the Western Union Company took place on May 1st

The following names embrace the new appointments:

H. C. Maynard, Manager; F. W. Jones, 1st Assistant Manager; C. G. Sholes, 2d Assistant Manager; H. W. Plum, 3d Assistant Manager; L. C. Springer, Night Manager; C. H. Kelly, 1st Assistant Night Manager; W. A. Leary, 2d Assistant Night Manager; J. Dewitt Congdon, Late Night Manager.

IT is a sad commentary upon the awful loss of life by the disaster to the steamship *Schiller* at the Scilly Islands last week, that all of these precious lives might have been saved had there been telegraphic communication between Bishop's Lighthouse and the shore. This is the conclusion of the jury of inquest who sat on some twenty of the bodies which had been recovered, and this opinion is strengthened by the views of the surviving officers of the vessel. Another application of electricity might have averted the danger altogether. The power of the electric light to penetrate fog is well known. From the reports which have reached us, it seems that the ship struck within a mile of the light, which was totally invisible on account of the fog. If this light had been electric it would have been visible for a much greater distance than from the position of the vessel a quarter of an hour before she struck on the rocks, and might have enabled her to have avoided them entirely.

### LONDON vs. NEW YORK.

We publish elsewhere an interesting article from the London *Times*, entitled "Central Telegraph Stations," in which the great telegraph stations of the British Post-Office at St. Martin's le Grand, London, and of the Western Union Telegraph Company, Broadway, New York, are compared, and which will well repay perusal. Nothing could better illustrate the immense expansion of this last and most important element of modern civilization than the detail and data which this article supplies. The occasion of it was our descriptive article of February 15th, and which the writer freely uses. Yet if the statement of the *Times* be taken without explanation, a very imperfect conception of the relative significance of these two, in some degree, representative stations, would be formed in the mind of the general reader. To one or two points only, however, will our space permit us to direct attention, leaving to the future some more careful and elaborate exhibit of some interesting features of modern telegraphy in the systems of these two nations.

It is stated in the *Times* article, that on a fairly busy day, when Parliament is in session, half a million words, equal to 250 densely printed columns of the *Times*, are transmitted from the London office to the newspapers of the kingdom, as against 90,000 in New York. Now, first of all, it should be remembered that New York has no Parliament, and is not at all a political centre. The chief political radiata of America is Washington. Yet this is a subordinate fact.

But when it is explained that, instead of the American plan of long and combined circuits and branches on which are numerous offices, to each of which the news dispatches, combined in a single report and, by a single manipulation, are simultaneously dropped, and by each of such offices are distributed among the presses of each city by unfolding with carbon paper—they are sent from London by 40 different wires, 19 of which are leased by as many provincial newspapers, and that essentially the same matter is punched out by a multiplying process and duplicated to each paper direct, the secret of this apparently immense difference is shown. By a similar process of computation of work done with equal rapidity and satisfaction within the State of New York alone, and not including the 18 daily presses of New York City and its suburban cities and towns, the New York Central office transmits daily, by a single operator and by the use of a single wire, and repeating instruments at radiating points, simultaneous reports to 45 papers, at a daily average of 382,500 words. If to this we add the press matter sent by another single wire from the same office eastward to the papers of New England, we have for the service of two wires and the manipulation of two operators a daily delivery of over 700,000 words of press reports, to say nothing of the nearly 200 presses in the South and West and in Canada, which share in the distribution of

the public news after passing the boundaries of the State of New York.

This peculiarity in the English system of numerous independent wires also explains the use of 23,000 cells of battery in the London office, at St. Martin's le Grand, against 7,000 in the Central office of the W. U. Tel. Co., and the employment of 58 sets of automatic machines explains the employment of 1,200 persons to work 450 instruments. It should be remembered also that, whereas in London the transmission of despatches is greatly centralized by the use of pneumatic tubes localizing all business at the chief station, a large amount of business is done in New York direct from numerous branch offices, to which loops connected with main wires are given, rendering them independent of the Central office.

It is utterly impossible in an editorial article to enter upon the examination of the two processes referred to, in a way to be entirely lucid to the general reader. We design, however, hereafter to present the methods pursued in the distribution of news by the Telegraph and News Associations, so as to give a clearer perception of their extent and processes. We cannot close this article better than in the language of the *Times*: "If the telegraphic system is not yet perfect, it will be granted, at least, that its development thus far has been singularly rapid, and there is, perhaps, no better evidence of this than in these great Central offices of London and New York."

### EXPRESS MESSAGES.

Mr. Latimer Clark, in his recent address before the Society of Telegraph Engineers, introduces a proposition which we believe the public will never willingly accept. In order that we may not do Mr. Clark injustice, we quote his own language. After stating his belief that in the future there will be offered to the telegraph for transmission a vastly enlarged volume of business, he says: "In order to obtain the full benefits of telegraphic communication, any reduction in the cost should be accompanied by the introduction of *express messages*, a species of message bearing the same relation to ordinary messages that passenger trains bear to goods (freight) trains. The cost of these messages should be at least five or ten times as great as that of ordinary messages; should be subject to the same rules of priority among themselves as now exist, but they should in all cases take precedence of the ordinary heavy traffic."

This is not the first time which this discriminating process has been proposed, either in Europe or in America. It seems to be a favorite idea on governmental lines in Europe, as one of the processes by which government telegraphs may be made profitable. Mr. Clark writes under the like impression. He says that if such a system is adopted, the pecuniary gain to the "Post-Office" will be very great. Such was our patriotic friend Hubbard's idea. It was the little joker which was to line the pockets of the governmental firm of Hubbard & Co., when

the great low tariff line was built. There was "millions in it." There can be no question that under certain promises of priority in sending dispatches in periods of unusual commercial activity, or in the great speculative eras which ever and anon come, stirring the feverish greed of money in men's minds, large sums could be easily assessed. And yet we believe the system, if established, would be perilous, and destructive, and disastrous. No low-priced message could hope for speedy delivery. It would be a prohibitory tariff for the masses for the kind of service which draws men to the use of the telegraph at all. The nearest approach to it which, so far we see possible is in the discrimination made in America between the day and the night service, the latter being one-half the cost of the former. Nothing in America would more surely snatch the telegraph system from private enterprise and administration than the discriminative tariff proposed by Mr. Clark, and which may be a feeler of the British Post-Office administration to sound public sentiment in relation thereto.

#### THE WESTERN UNION AND THE PRESS.

The following letter, addressed to PRESIDENT ORTON by SECRETARY CARVER, of the Northwestern Associated Press, transmitting a resolution adopted by that Association at its recent session, is a just recognition of the remarkable facilities afforded by the Western Union Telegraph Company to its patrons:

OFFICE OF "THE HERALD,"  
DUBUQUE, Iowa, May 10, 1875. }

Hon. WILLIAM ORTON,  
President Western Union Tel. Co.

DEAR SIR: At a meeting of the Northwestern Associated Press, held in Chicago on Wednesday, May 5, 1875, the following resolution was adopted, a copy of which I was directed to transmit to you:

"Resolved, That as an Association our thanks are due to the Western Union Telegraph Co. for the fairness, promptness and liberality with which they have observed their contracts with this organization; that we equally owe hearty thanks to Gen. Stager and Col. Wilson, personally, for their faithful attention to our interests, and for their kindness in extending to us at various times in the past year even greater facilities than we were entitled to; and that, through Gen. Smith, our agent in Chicago, we have been placed under renewed obligations for most faithful, vigilant and acceptable services, the value of which we desire in this united manner to recognize."

I am pleased to assure you that this resolution met with the unanimous indorsement of the members of the Association.

Very respectfully,

D. D. W. CARVER, Secretary.

#### THE TELEGRAPH POLES IN THE STREETS.

To the Editor of *The Tribune*.

SIR: The following quotation from the editorial column of this morning's *Tribune* contains an unjustifiable reflection upon the majority of the Assembly Committee on Affairs of Cities, as well as upon the officers of those telegraph companies, who, in an open hearing, presented their objections to the bill to which you refer:

"Messrs. Hess, George, Taylor, McGroarty and Worth have evidently heard of something to their

advantage. They are firm converts to the doctrine that telegraph poles are beautifiers and safeguards in great cities. How did the Western Union and the Atlantic and Pacific persuade them? Did Judge Lowrey make eloquent speeches at them, or was another and more important officer called in to tender (legal tender) more potent arguments? At any rate these seem to be the great men who are stopping underground telegraphy. Their statesmanlike minds do not approve of it."

The telegraph companies are opposed to the bill because, in their judgment, its passage and enforcement would destroy the telegraph in New York City. They presented to the Committee the evidence of the ablest experts in the country, who fully sustained that opinion, and gave their reasons at great length, examining and explaining all the experience of the world in underground lines, and showing that they have failed, or are failing, everywhere under such conditions as prevail in New York. They ended by giving it as their judgment that much the larger part of the telegraphing now done in New York would be impossible over wires laid in the ground.

The counsel of the telegraph companies, Mr. Lowrey, claimed that the companies were occupying the streets with their poles by a grant from the Legislature the same as that by which street railroads hold their right of way. What would be said of a proposition to require all the street railroad companies to take up their rails and substitute underground railroads?

The Committee gave several attentive hearings upon this subject, which were notified in advance in the papers. Nobody appeared in support of the bill, notwithstanding the urgent appeals of *The Tribune*.

The insinuation that "more potent arguments" were used to influence members of the Committee, is cruel as it is untrue, and unjust to the members as well as to the telegraph companies. There was no necessity for "more potent arguments" than those which were addressed orally to the Committee, in the hearing of a large audience. No intimation has ever been made by or on behalf of any member of the Committee, for any consideration, great or small, nor has any intimation or proposition of compensation or consideration been made by or on behalf of the telegraph companies, to any member, or to any one else, for their benefit; in short, the innuendo of your article is wholly groundless and without justification. Such intimations are especially unjust to this company. By reason of the fact that our business and property is subject not only to the jurisdiction of the United States and of every individual State and Territory, but also of every city and every considerable town and village in the country, it may well be supposed that we have many temptations to protect our interests against unjust exactions. Nevertheless, it is an inflexible rule of this company, which has never yet been departed from, to refuse and resent all such overtures when made to us, and never to make or allow them to be made for us. The officers of this company are of opinion that many of the vexatious attacks in Washington and elsewhere during the few years past would have been easily averted had they chosen to depart from this principle. It is hard that men who have, to their considerable detriment and to their great prejudice in the good opinion of the noble army of strikers which infests this country, lived up to this principle, should be made subject to insinuations so causeless as the one quoted above.

Yours very respectfully,

ALONZO B. CORNELL,

Acting President Western Union Telegraph Co.  
New York, May 5, 1875.

#### CENTRAL TELEGRAPH STATIONS.

From the *London Times*, April 28, 1875.

The great commercial capitals of the world, London and New York, have within a very short period been provided with Central Telegraph Offices which for extent and completeness are unequaled elsewhere. The Central Telegraph Station in St. Martin's-le-Grand, and the new offices of the Western Union Telegraph Company in Broadway, New York, may be regarded as evidences of an amount of progress such as has attended few institutions in our time. Less than 30 years ago the "system" of the late Electric Telegraph Company, or, to speak more correctly, the telegraphic system of the United Kingdom, consisted of a line to Nine Elms, and a small office at 334, Strand. Similarly, in 1846, a single wire was erected to an obscure office beneath the express offices at No. 16 Wall street, New York, and two wires from Washington terminated in a small room over the Ferry-house in Jersey City, where three clerks easily, and not very continuously, performed the whole telegraphic business of the City of New York. We need not trace the progress of the Electric Telegraph Company eastward until it acquired extensive offices, first, in Founders' Court, Lothbury, and, subsequently, in Telegraph street, Moorgate street. Nor need we do more than simply mention the British and Irish Magnetic Telegraph Company, with its offices in Threadneedle street, and the United Kingdom Telegraph Company, located in Gresham House. All three were eventually housed in the premises built by the Electric Company in Telegraph street, and thence the next move was to the new Post-Office in St. Martin's-le-Grand. This event occurred on the 17th of January, 1874; and, little more than a year afterwards—viz., on the 1st of February last—the Great American Telegraph Company moved to its new premises in Broadway, New York.

The American structure has been erected at a cost of more than two million dollars, and a considerable portion of this amount has been subscribed in England—chiefly in London, we believe. It is built of brick and granite, in what, with some latitude, may be designated as the French Renaissance style, the main idea in its construction being to reduce in appearance, by the proportions and the arrangement of the details, the great height of the building, as compared with its width or front. The building is said to be fire-proof throughout, wood having only been used for the doors, window-sashes, and the wainscoting. Most people are familiar with the appearance of our new Post Office buildings in St. Martin's-le-Grand. Many regard them as being wholly devoted to telegraph purposes; but it should be explained that only the top floor, the basement, and one or two rooms on the intervening floors are so occupied. The building of the Western Union Telegraph Company in New York extends to the height of no fewer than ten separate floors, and is mainly occupied by the various offices of the Company; but it is with the operating rooms, situated on the seventh floor, just as it is with the instrument galleries in St. Martin's-le-Grand, that we are mainly concerned in speaking of both as central telegraph stations. The American room is 145 ft. long, 70 ft. wide, and 23 ft. high, or about the size of the central gallery in St. Martin's-le-Grand. This gallery, supplemented by the side wings, and forming a space somewhat resembling the letter H, has a superficial area of not less than 20,000 feet; so that the American room is not more than half the size of our own. The instrument tables do not extend to more than 500 ft. in length in New York; while those at St. Martin's-le-Grand extend to



2,800 ft., or more than half a mile. In America, where the system of "sound" telegraphy prevails to a large extent, the tables are cut into short lengths, each separated into four compartments, so as to isolate the operators from each other and to confine the sound as much as possible. Here, owing to the variety of systems employed and the extensive use of automatic instruments, the tables are of considerable length, and are open throughout. In the Western Union Company's new office less than 200 instruments of all kinds are employed, including 149 Morse instruments, 15 sets of Duplex apparatus, and six of Phelps's printing instruments. In St. Martin's-le-Grand the total number of instruments exceeds 450, and includes 195 Morse printers, 122 single needle instruments, 65 sets of Duplex apparatus, 53 sets of Wheatstone's automatic instruments, and 18 of other sorts. The switch or test board of the American office is arranged for the distribution of 300 wires; that in our own Post-Office building is arranged to accommodate 800 circuits, and if need be the provision can be extended to 1,000 lines without difficulty. Batteries, which are to the telegraph what the boiler is to the locomotive, are always an object of anxiety in planning a large telegraph office. They cannot well be situated in the instrument room on account of their peculiar construction and their continual wants; and yet they should not be too far away from it. In this respect the New York office, where the batteries are stored in a room immediately underneath the operating room, has a decided advantage over the London office, where several floors intervene between the instrument galleries and the battery room. In extent, however, the two departments are as widely different as are the arrangements in the respective instrument rooms. In the Western Union Company's office provision is only made for a *maximum* power of less than 17,000 cells; while the number of cells actually in use does not exceed 7,000. At St. Martin's-le-Grand 50,000 cells can readily be accommodated in the large room in the basement of the building set apart as a battery store; while at the present moment not fewer than 23,000 cells are actually in use. Not far short of two miles of shelving have been constructed in this room for the reception of batteries, and a perfect avalanche of wires descends from the instrument galleries above in order to transmit the motive power to the 450 instruments, whose wants are as numerous as they are varied and unceasing. Including these battery connections and other connections between different points in the instrument galleries, not less than 260 miles of gutta serena covered wire are buried under the floors of the building in St. Martin's-le-Grand.

We have been struck with the small extent of the pneumatic system in the great Telegraph office of New York. Apparently the system is confined to the building itself, and does not extend beyond the receiving and delivery departments. A single 20-horse power engine is all the motive power required in connection with this department, the remaining machinery, situated in the basement of the building, being required in connection with the elevators, and for heating purposes. The pneumatic system at St. Martin's-le-Grand is one of the great features of the building. No fewer than 25 separate tubes communicate with out-stations in the Metropolitan district, ranging from Fenchurch street to Tower Hill in the east, to Temple Bar and Charing Cross in the west. These tubes extend to a length of nearly 18 miles, and are worked outwards by pressure and inwards by vacuum. In addition to these outlying tubes there are 12 tubes within the building itself, used for blowing messages between one part of the instrument gallery and another. So

rapidly is this effected that an average of four seconds only is occupied by the "carrier" in making the journey across the room, or from one wing to another, as the case may be. The motive power by which the tubes are worked exists in the basement of the building, in the shape of three steam engines, each of 50-horse power. Two of these are constantly employed in pumping air into or sucking it out of huge mains carried up the outer walls of the building, and connected with the tubes up-stairs. The third is at rest, ready for any emergency, or to take the place of that whose turn for rest next comes round. The engine-room resembles nothing so much as the hold of a great steamship; and from the peculiarly interesting character of the machinery it is a great source of attraction to the numerous visitors to the Central Telegraph Office. Four boilers, each of 50-horse power, and fitted with Vigars' patent stokers, occupy a corresponding position of the basement to that occupied by the engines; and an Artesian well is in process of sinking, which, it is hoped, will supply not only the boilers, but the whole of the building, with water.

It only remains to notice the *personnel* of the two great telegraph offices of the world, and to sum up the amount of business transacted in each. Less than 300 persons, including 75 female clerks, are employed by the Western Union Company in its central office, in New York, and the average number of messages disposed of daily, exclusive of news messages, is stated to be 24,000. Allowing for the news service, which is stated to amount to about 90,000 words daily, an average of 27,000 messages a day would be attained. Here, in London, as many as 1,200 persons, including 700 females, are employed in the Central Telegraph Station. The number of ordinary commercial messages dealt with in a day, allowing for such as have to be retransmitted—*i. e.*, received on one wire and sent out on another—is upwards of 50,000, and taking the news service, exclusive of special wires, at 500,000 words a day, which is a fair average, during the Parliamentary session a total of more than 70,000 average messages would be reached. The news service is a feature to which very special importance is attached at our Central Telegraph Station. Special wires, known as the "Express Circuits," are set apart for the service, and the Wheatstone system, which, while it economizes the wires, largely increases the staff, is almost exclusively employed. At night, when the great bulk of the news work comes in, as many as 40 wires are exclusively occupied in the transmission of matter for the press throughout the United Kingdom. Nineteen of these wires are leased out to certain provincial newspapers in England, Scotland and Ireland. The remaining 21 are worked to the principal towns of the kingdom, and taking their united capacity, it would be found that on a fairly busy night as many as half a million of words, equal to 250 closely printed columns of *The Times*, would be disposed of. Besides the clerks employed at the newspaper offices in working the special wires, as many as 200 clerks are employed each night at the Central Telegraph Station between 8 P. M., when the female staff leaves duty, and midnight, when the bulk of the news work has generally been disposed of. From midnight until 2 A. M., more than 100 clerks are usually employed; and at no time of the night is the number less than 70. Scarcely, indeed, has the night service of news been completed when the morning service begins, and it would be almost impossible to select any hour out of the 24 when press matter, either in the shape of markets, exchanges, or general news, Reuter, sporting, or Parliamentary, is not passing over the wires.

If the telegraphic system is not yet perfect, it will be granted, at least, that its development thus far has been singularly rapid, and there is, perhaps, no better evidence of this than in the great central offices of London and New York. After all, these immense establishments are but the growth of little more than a quarter of a century; for, as we have seen, it is less than 30 years since a small room in West Strand, and another in Wall street, represented the headquarters of the telegraph system of the Old World and the New.

#### STRUCK BY LIGHTNING.

Mr. D. Pigeon gives, in *Nature*, the following interesting account of the effect of lightning upon himself and members of his family, during a recent thunderstorm: "The house, in which with my family I have spent the Winter, stands in the center of Torbay, and close to the sea. In the garden, which gives access to the shore, is a flagstaff, 50 feet high, with a metal vane at the top, the mast being steadied at about 25 feet from the ground in the usual way with iron wire 'guys.' About a foot above ground, each wire rope terminates in a  $\frac{1}{4}$ -inch chain, which is anchored a few feet in the soil.

February 25th, 1875, was a rainy day during the forenoon, with heavy wind from the southeast, but in the afternoon the sky cleared. There had been no sign of thunder all day. At 5 P.M. my wife, my son, and myself were standing under the flagstaff and within 10 feet of a mooring chain, watching the bay, when the vane was suddenly struck by lightning, which broke the mast short off in two places, tearing and splitting the wood between the vane and the iron guy ropes. Through these the discharge then passed to the ground, but three out of four mooring chains were broken.

The broken mast and vane fell to the ground close to us. Heavy hail followed the flash, the wind falling instantly to a dead calm; a second but distant flash was seen twenty minutes later, after which there was no more lightning. The discharge startled the whole village of Paignton; the coast guard officer compares the explosion to that of a 300-pound gun; and at Torquay, 3 $\frac{1}{4}$  miles distant, a scientific friend speaks of both flash and crash as most terrific.

I must now attempt to describe the effects on ourselves and the impressions on our senses. Of the three, my wife only was "struck," and fell to the ground, my son and myself remaining erect, and all three retaining consciousness. For more than half an hour my wife lost the use of her lower limbs and left hands, both of which became rigid. From the feet to the knees she was splashed with rose-colored tree-like marks, branching upwards, while a large tree-like mark, with six principal branches diverging from a common center, thirteen inches in its largest diameter, and bright rose red, covered the body. None of us are certain of having seen the flash, and my wife is sure she saw nothing. As to the noise, my wife heard a "bellowing" sound and a "squish," recalling fireworks; my son also heard a "bellow," while I seemed conscious of a sharp explosion. My wife describes her feelings as that of "dying away gently into darkness," and being aroused by a tremendous blow on the body, where the chief mark was afterwards found. My son and myself were conscious of a sudden and terrific general disturbance, and he affirms that he received a severe and distinctly electrical shock in both legs. My left arm, shoulder, and throat especially suffered violent disturbance, but I did not think it was electrical. As I turned to help my wife, who was on the ground, I shouted, as I thought, that I was unhurt,

and hoped they were also, but it seems I only uttered inarticulate sounds, and my son, in his first attempt to answer, did the same. This, however, was only momentary; in an instant we both spoke plainly.

Neither of us referred the occurrence immediately to the true cause, but the idea of being fired at was present to all our minds; my wife, indeed, remained of opinion that she was shot through the body until she heard me speak of lightning. And infinitesimal lapse of time enabled my son and myself to recognize lightning; but I cannot say whether I did so before or after my first glimpse of the wreck on the ground. Neither of us heard or saw the mast fall, though it descended fifty feet, and fell on hard gravel close to us. My son and myself both experienced a momentary feeling of intense anger against some "person or persons unknown," further showing that we preliminary referred the shock to some conscious agency. I ought, perhaps, to add that neither of us felt any sensation of fear at the time, but we were all nervous for several days after.

I have endeavored to keep to fact throughout, but I venture to add a remark made by my wife as we raised her from the ground: 'I feel quite sure that death from lightning must be absolutely painless; and I offer it as an unconscious corroboration of views on this subject which our experience seems to strengthen.'

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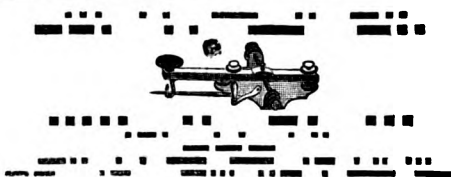
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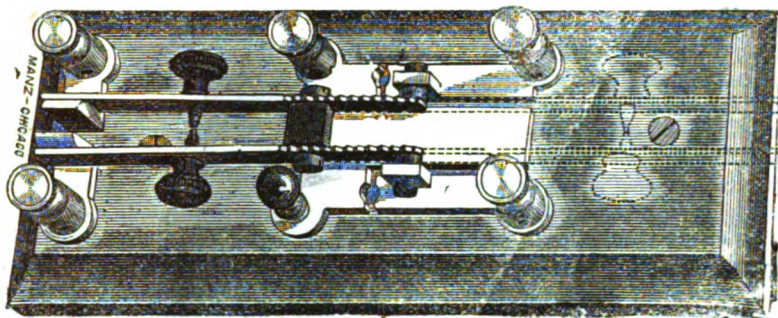
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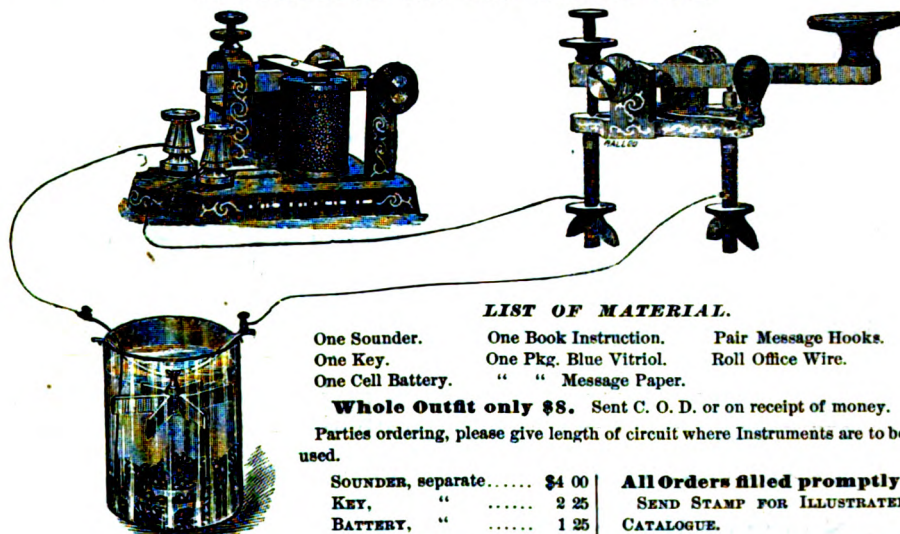
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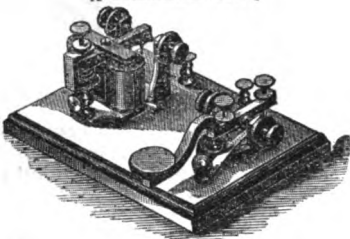
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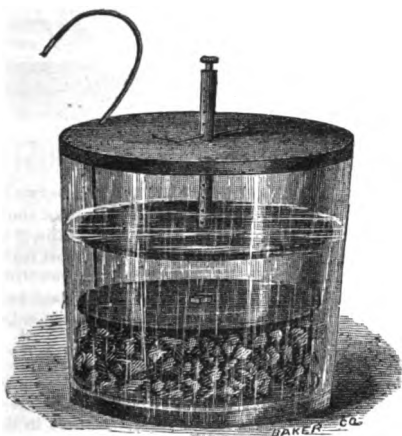
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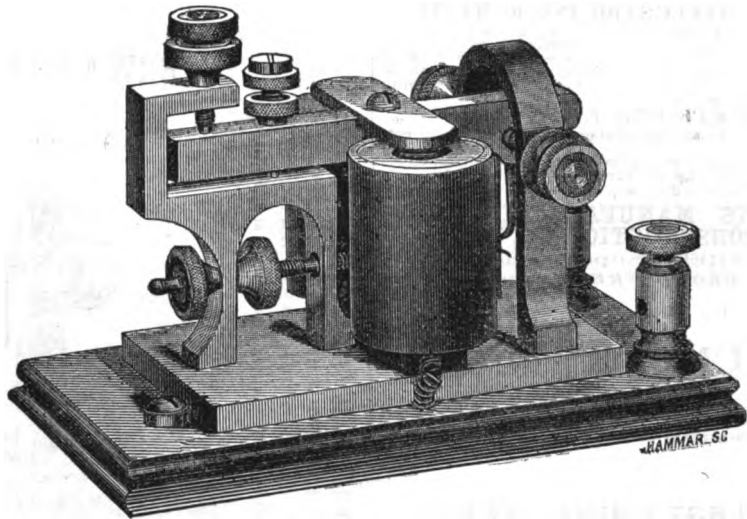
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They give enormous sound with but little Local Battery power. Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder is desired.

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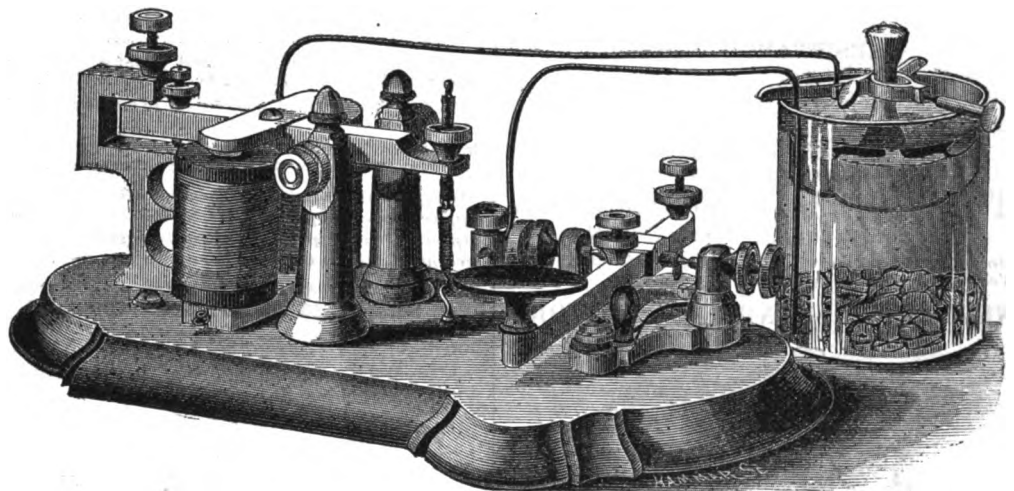
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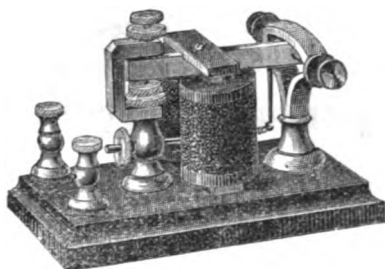
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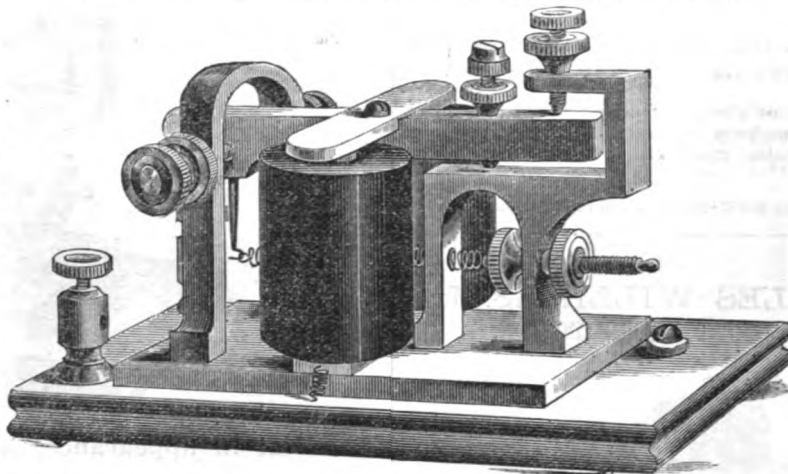
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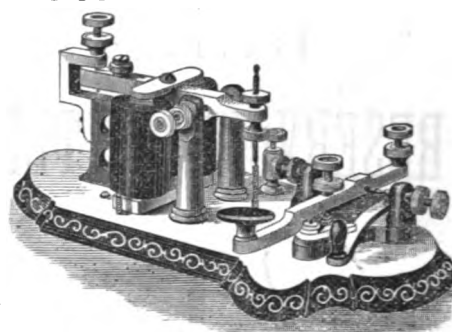
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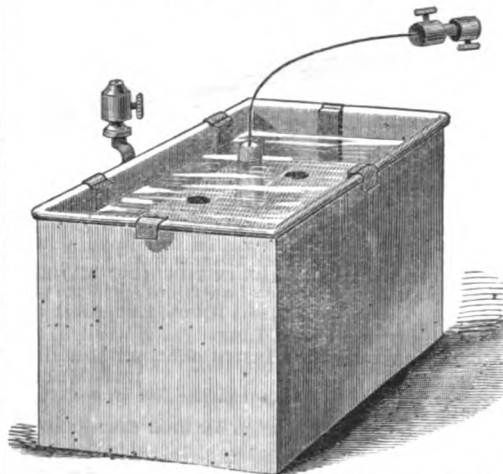
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For OPEN CIRCUITS, where all other gravity batteries are acknowledged failures, the Eagle's Battery is found to be, in every respect, A PERFECT SUCCESS.

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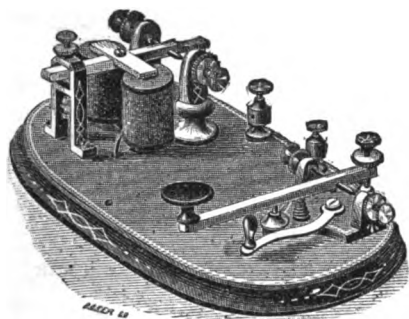
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Price, \$8.

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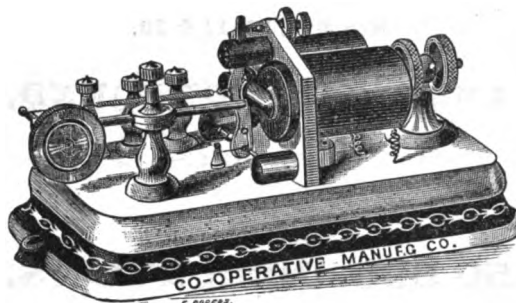
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where we have increased facilities for manufacturing, so that we now can promptly fill all orders on short notice; and our starting motto will be fully maintained, which is, "All work done in a workmanlike manner and of the very best material, which will not fail to gain the confidence of all and give entire satisfaction to the purchaser," as we started on the above principle and have numerous letters of recommendation which fully certify to the fact.

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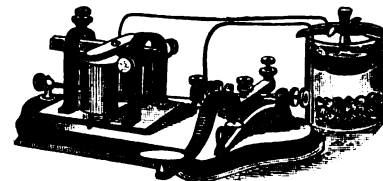
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Telegraph Apparatus.

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When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm.

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To its Subscribers, by

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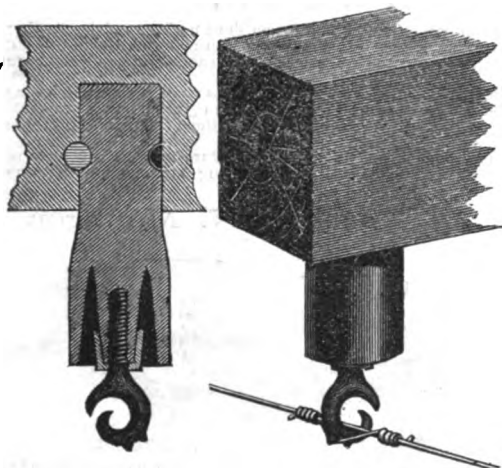
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**TELEGRAPH COMPANIES and**  
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 are invited to examine the merits of our new and improved  
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### KENOSHA CARBON INSULATORS!

These insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellant of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of SIX YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average,

MORE THAN TEN TIMES AS GREAT

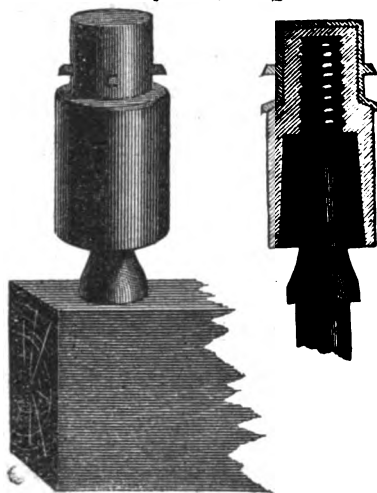
during the prevalence of rain or fog.

Immense numbers of these insulators are in use by

**The North Western Telegraph Co.,**  
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 as well as many RAILWAY and OTHER TELEGRAPH LINES,  
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Besides the suspension insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, and which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



### CAP INSULATOR, WITH PIN OR BRACKET,

which is fitted with a zinc protection, as shown in the above figure.

THE KENOSHA INSULATOR is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice, CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

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 GENERAL EASTERN AGENTS.

**For the Spring Construction,**  
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**Nos. 8, 9, 10, 11 & 12,**

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TOGETHER WITH A LOT OF

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Which answers every purpose for Short Lines, where parties desire to economize.

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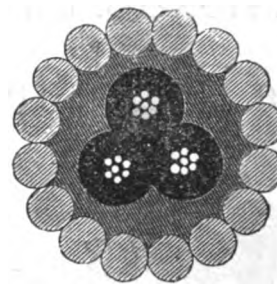
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Have on hand and made to order  
**SUBMARINE TELEGRAPH CABLES,**

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**BLASTING AND MINING PURPOSES,**

in every variety desired.

As an Insulation for Telegraph Cables and Electric Conductors **GUTTA PERCHA** has been universally adopted by all scientific and practical Electricians and Manufacturers of Telegraph Cables and Wires in this country and Europe, and has sustained, with increasing confidence in its superiority, the practical test of over twenty years' general use.

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that he will guarantee to make and deliver at his Factory any style of Cable, Insulated with Gutta Percha, as low as they can import Cable of the same style and quality.

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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 11.

NEW YORK, JUNE 1, 1875.

WHOLE NO. 182.

## THE QUADRUPLEX PATENT CASE.

BEFORE THE HONORABLE SECRETARY OF THE INTERIOR.

In the Matter of the Appeal of EDISON & HARRINGTON from the decision of the Commissioner of Patents of March 20, 1875, to the Secretary the Interior.

REPLY OF COUNSEL FOR MR. GEORGE B. PRESCOTT

To the respective briefs of B. F. Butler, Esq., counsel for Edison, and John H. B. Latrobe and Leonard Myers, Esqs., counsel for Mr. Harrington:

The objections taken to the decision of the Commissioner of Patents rest chiefly upon statements of fact by counsel. We have no certified record, no pleadings, no ascertained issues below, no exceptions. That no such proceeding as is being prosecuted (that is a complete inquiry into and revisal of the adjudications of fact and law by the Commissioner) was intended to be given to the Secretary of the Interior is clearly enough shown by the fact that no forms of procedure are provided enabling him to limit, accurately and correctly, as a judge in appeal always must, the issues on appeal.

Without the assertions of fact made by counsel for the two appellants, they would confessedly have no questions of law for review here.

We dispute these assertions of fact as to every material averment.

They are chiefly as to what occurred before the Commissioner. We assume that if the honorable Secretary deems it his duty to investigate these contradictions, he will make inquiry of the Commissioner. We assert that he will find the facts to be

1. Not that the Commissioner refused evidence that the inventions in question existed at the date of Edison's agreements with Harrington, or that such evidence was offered or fact asserted.

But, on the contrary, that the matter arose before the Commissioner as follows, viz.: The Commissioner asked counsel for Prescott, on the argument, how they could show that "these inventions did not exist at that time?" That one of the counsel for Edison and Harrington interposed, saying: "Yes; how can they show this? There is nothing on the record by which they can show it, and we certainly shall not consent to anything by way of proof outside the record."

At this point the Commissioner asked counsel for Edison and Harrington if he claimed the fact to be that these inventions did exist at that time, and was answered that "it did not appear that they did not so exist." The language quoted above is substantially as spoken.

Argument ensuing, the Commissioner was convinced that Harrington, standing there to assert title upon a specific fact (the truth of which he and Edison could show more easily than any one else), was bound to make affirmative proof of that fact. Moreover, he was convinced, by examination of the caveats and other records of his office, that the record raised a strong presumption of fact that these inventions were not made until several years later, to

which presumption he not unnaturally alluded in some *obiter dicta*. [See note on pp. 7, 8.]

He said in his opinion "there is no evidence that the inventions described in these applications" (the italics are ours) "were in existence at the time this instrument was executed. It is not even claimed by Harrington that they were. He simply says that there is no evidence that they were not then in existence."

It is to be observed that it is not the present counsel for Harrington (who appeared there as counsel for Edison), but the present counsel for Edison, who was not at the hearing at all, who asserts a refusal by the Commissioner to receive evidence. As was once said by a distinguished advocate in Boston, who, though stone-deaf for many years, continued to participate in the trial of causes: "No one can know what an advantage it is not to have heard the testimony on the other side."

It would seem that counsel for Edison finds some degree of the same advantage, in not reading—or perhaps in assuming that the Secretary will not read—the opinion which he is asked to overrule. Certain marked eccentricities, in stating matters of fact, which show themselves in the bulkier of the two briefs to which this is a reply, we attribute to the client Edison, since they involve exercise of inventive powers which his counsel could scarcely claim; but the particular tergiversation, shown below, in the manner of misquoting the opinion of the Commissioner in order to sustain a charge that he did not admit proof (which was never offered), is clearly of another origin.

OPINION OF COMMISSIONER OF PATENTS, AS QUOTED BY GENERAL BUTLER: "I have come to the conclusion that it is not necessary for the Commissioner to decide whether the assignment from Edison to Harrington, dated April 4th, 1871, covers these inventions or not, because there is no evidence that the inventions described in these applications were in existence at the time the assignment was executed, and in the absence of such proof the probabilities must guide, and these are all against the existence of the inventions at that time." Edison's Brief, p. 18. It will be noticed that Gen. Butler places no asterisks or other customary signs to warn the reader of the important ellipses in his quotation.

OPINION AS RENDERED AND PRINTED IN OFFICIAL GAZETTE: "In the investigation of this matter I have come to the conclusion that it is not necessary for the Commissioner to determine whether the assignment from Edison to Harrington, dated April 4, 1871, covers these inventions or not. However this question may be decided finally, there is no evidence that the inventions described in these applications were in existence at the time this instrument was executed. It is not even claimed by HARRINGTON THAT THEY WERE. HE SIMPLY SAYS THAT THERE IS NO EVIDENCE THEY WERE NOT THEN IN EXISTENCE. BUT IN A COURT OF EQUITY, ONE OF THE FIRST REQUIREMENTS MADE OF HARRINGTON WOULD BE TO PROVE AFFIRMATIVELY THAT EDISON HAD PREPARED THESE INVENTIONS WHEN HE EXECUTED THE ASSIGNMENT OF APRIL 4, 1871. In the absence of such proof the probabilities must guide. These are all against the existence of the inventions at that time."

The small capitals above indicate the omitted portions.

2. That contrary to the intimation at the bottom of page 8 of brief for Harrington, the idea that the agreement with Prescott was not genuine or authentic, was not intimated before the Commissioner (otherwise than by the innuendo of counsel, perhaps,) but that, on the contrary, the Commissioner, in reference to a half intimation of this character,

asked the question, whether such a state of facts was pretended, intimating his design to hear anything of that sort which might be suggested, to which answer was given that no claim of that sort was made.

As to the argument on the illustration so harped upon of instance of a forged paper found on record (Edison's brief, p. 17), certain considerations at once present themselves to the mind.

First.—In such a case the offer would be to dispute or correct the record; and what the commissioner or any court could do in "purging its own records" (to use a phrase of Judge Story's), is an inquiry wholly foreign in its nature and solution from any inquiry before us.

Second.—Look at the manifold illustrations offered by instances arising under the recording acts. Without involving the inquiry in the tangle of conflicting assertions, whether sealed instruments can be attacked collaterally or whether they can be overthrown only by direct assault, it is clear that at law and in equity the mode always exists to prove the nullity or vice of a specialty, and to have its nullity decreed or adjudged.

Very likely in an action of ejectment and in many other actions in which certified copies of deeds are read, the door is open to proof of fraud and forgery in every case; but what would be thought of insisting either that a recording officer or an attorney making a chain of title from the record, or a higher court reviewing a case in which no pretense or suggestion of fraud or forgery had been made at the trial, undertaking an inquiry, with or without evidence, into the genuineness or validity of an original standing on the record with nothing visible to impair it?

Obviously, in all such instances beyond the fact that the parties would be concluded as a rule of law by omitting to suggest in the first instance any defect in a paper, is the rule of common sense and reason, which teaches us that in a case like that before us no such difficulty could occur except from stupidity beyond conception (in an instance in which lawyers appeared) or of collusion by the party and his counsel; there could be, in such a case as this, no discovery of the fact afterwards in the sense of newly-discovered evidence. The illustration is a mere extravaganza, a far-fetched decoction of confused and disingenuous ingredients.

Both counsel have seemed to find it within the proprieties of advocacy to make assertions without proof, touching the relation of Prescott and Edison, which makes it our duty to state the facts. This statement will be much illuminated, however, by a preliminary reference to one of the practices which the counsel for Mr. Edison feels himself at liberty to resort to, relating to a pretended part of the record before the Commissioner, printed by him as appendix C to his brief.

He begins his brief by saying:

"The questions herein submitted arise upon the following documents of record:

First, etc.

Second, etc.

*Third.*—Memorandum of agreement between Thomas A. Edison and George B. Prescott, being joint inventors of certain improvements in telegraphic apparatus, dated July 9th, 1874.

On page third he says: "The Honorable Secretary of the Interior, in deciding the preliminary question, &c., determined that he would take no evidence, oral or written, outside of the records of the office, passing only upon what the Commissioner had before him on the records of the office at the time of his decision."

"In the exhibits above set forth we have endeavored (Labor of Hercules) 'to produce nothing which is not upon the records of the Patent Office, (with a single exception), and shall draw from them, &c.'"

On page 29 he says: "It will be observed that the deed of the 9th of July was not recorded until afterwards." The manner in which, while professing to state the record as it existed before the Commissioner, counsel interpolates an instrument which was not before the Commissioner, and which was not on the records of the Patent Office when that argument was submitted, and is believed not to be there now: without any mark to distinguish it where it stands from the other authentic papers by which it is flanked, constitutes an instance, almost unique, of a certain kind of practice, happily but little in vogue in the higher walks of the profession, the name for which is traditional, and need not be suggested.

We were charitably disposed to find that this surreptitious exhibit was the "exception" referred to at page 3; but the inferential assertion at page 39, that this instrument has been recorded, added to the fact that an exception adequate to meet and satisfy the language of the counsel is found in the newspaper article annexed as an appendix, which could not be on record, compels us to abandon such judgment, and shows clearly a mendacious purpose, equally uncomplimentary to counsel, who must have been supposed capable to overlook it, and to the public officer upon whom the attempt is made.

We leave it to the distinguished and experienced lawyer at the head of the Department of the Interior, to judge of a case to whose merits such practices are kindred.

Counsel for Harrington after putting (p. 8) a hypothetical case of fraud, adds: "The case here put by way of illustration is to some extent the case before the office so far as the principle is involved;" and counsel for Edison (pp. 13, 27 and elsewhere) also speaks freely without adding the slightest proof of what he assumes to be the equity of the relation between Edison and Prescott, and, when speaking of facts in this connection, precisely the opposite of what he asserts is the truth. This statement is also made pertinent by the "statement of Harrington," just received, which we had never seen before, and to which have not now time to give more than a passing glance.

THE FACTS ARE, that in the early part of the year 1874, Prescott and Edison—the latter being an inventor of unquestioned ability, and the former a practical electrician of great experience and reputation—came together, after considerable negotiation, to unite their abilities and the facilities which Prescott, as the electrician of the Western Union Telegraph Company possessed, in the effort to make further improvements upon *Stearns' Duplex Telegraph Inventions patented in 1872* (then owned by the Western Union Telegraph Company), embracing the well known Bridge Duplex, and the application of the condenser to compensate for the static charge of the line, which enabled electricians to overcome certain difficulties, which were unknown before the *Stearns invention in 1872 developed them.*\*

\* The word duplex was first applied to any system of simultaneous or multiple transmission, in an article published in the *Telegraph*, of January 28th, 1872, in connection with Mr. Stearns' apparatus for working in both directions at the same time upon a single wire. The title of Mr. Stearns' first patents for transmitting messages simultaneously over a single wire, published in 1868, was "Improvement in Telegraph Apparatus," but when reprinted in the new form used by the patent office since 1871, the title of the accompanying drawings was changed to "Duplex Telegraphs," the term "duplex," as we have seen, never having been used in this connection prior to 1872.

The invention known as "The Bridge Duplex" was patented by Mr. Stearns on the 12th of November, 1872, and was first used by the Western Union Company in the Autumn of that year. The application of the condenser to Duplex Telegraphy was patented by Mr. Stearns on the 14th of May, 1872, this being the first patent ever issued in which the word "Duplex" is used as applied to a telegraphic apparatus, or in which a condenser is described or alluded to in connection with any method of simultaneous transmission. The purpose to which the

Thus the object of making the inventions now in dispute was to improve another device, which was unknown at the date of the Harrington agreement, and to deal with a scientific difficulty also unknown at that time.

The two gentlemen announced to that company their belief that they could invent such improvements, and their willingness to engage in the special labor involved, with the view of selling those improvements to that company, who alone, as owner of the basis patent, could use them. Edison's inducement was to obtain free use of the shops, the skilled mechanics, the lines, apparatus and operators of that company, and the benefit of the scientific and practical knowledge of Mr. Prescott. Mr. Prescott was able to furnish all these needed facilities, and they began and continued their work, with unexampled facilities, and without expense to Edison, for several months. Their labors together were so united in the development of new designs, that when, in July, they had reduced these inventions to the specific forms in which they now appear, they believed themselves to be joint inventors. They called upon a lawyer to draw up an agreement between them for the especial purpose of protecting Edison against any chance that Mr. Prescott might, by his relations with the Western Union Telegraph Company, avail himself of his legal power to give them a license without Edison's consent. Edison himself desired and required (a perfectly fair requirement, at once acceded to) those clauses of the agreement put in, which are now objected to by his counsel, at page 27, as follows: "And Prescott was careful to tie up these inventions, so that the real inventor, Edison, could have no use of them, without his consent, by the provisions which we have already considered," &c., but which Mr. Harrington, at p. 25 of his statement, accounts for otherwise.

The agreement of July 9th being made, the parties immediately called upon Mr. Edison's chosen patent agent, Mr. Serrell, to have the requisite proceedings taken in the Patent Office. In the careful investigation which then ensued, Mr. Serrell was led to doubt whether, in the division of labors which the supposed joint inventors had made, the inventions could be considered joint within the meaning of the law. After interrogating them as to the details of their work, he became satisfied that the specific things covered by the agreement of August 19, 1874, could not be considered as joint inventions, and he so advised them. As laymen they took his advice, it being undoubtedly true that in the several months they had been working together the special work of Edison had been to conceive new combinations, and that of Prescott to test, modify and adapt them, as well as to render the same service to some older conceptions of Edison which he had not yet been able to make work successfully.

condenser is applied in Duplex Telegraphy, and for which it was patented by Mr. Stearns, is to compensate for, or neutralize, the effect of the static charge of the line. The necessity for this compensation was ascertained for the first time in trying to work Stearns' Duplex Apparatus between New York and Buffalo in January, 1872, and no reference of any kind to the difficulties of working any system of simultaneous transmission, arising from the static charge or discharge of the line, was ever made in any patent or other publication, previous to that time.

Edison's applications for patents or improvements in Duplex and Quadruplex Telegraphy, numbered 94, 95, 96, 97, 98, 99, 100 and 112 (*being those now in question*), each and all contain devices which are either modifications or adaptations of the above mentioned inventions of Mr. Stearns.

Edison had invented two methods of simultaneous transmission prior to his contract with Harrington in 1871, one of which was described in the *Telegraph*, April 11, 1868. He did not, however, call these inventions Duplex Telegraphs, but Double Transmitters; and although these inventions come within the definition of what have since been known as Duplex Telegraphs, neither of them involved the improvements patented by Mr. Stearns in 1872, nor those subsequently assigned by Edison to Prescott, and now in question.

Since the date of the assignment of Edison to Harrington, April 4th, 1871, Edison has taken out 78 patents, 26 of which have been assigned to himself and George Harrington. Every invention thus assigned to Harrington falls under one of the following heads:

1. Automatic or chemical telegraphs.
2. Mechanical or copying printers.
3. Mode of adjusting an electro-magnet without infringing the Page patent.

Edison never patented either of his "Double Transmitter" inventions of 1868, nor did he patent any duplex whatever until February 24th, 1874. This duplex, not being an automatic or chemical device, was not issued assigned jointly to Harrington. A patent for a chemical duplex was issued November 11th, 1874, and this was assigned to Edison and Harrington.

This shows that the contract was never, until the issue (as we think it will be found fraudulently) of No. 182,633, April 28th, 1875, regarded as covering any devices except those for chemical automatic telegraphy. None of the inventions assigned to Prescott are of this character.

Accordingly, the agreement of the 9th July was abandoned, and, until it made its appearance in Edison's brief, was forgotten. The agreement of the 19th of August was substituted in its place. The same provisions restraining separate licenses, &c., were retained, and the paper, in the form advised by Edison's own lawyer, was put upon record.

In the brief submitted to the Commissioner (and which was again submitted to the Honorable Secretary) counsel for Prescott avoided, as much as possible, to deal with other than the questions of law; but it would be no longer just to the parties, nor to the law officers having this matter in charge, to treat the new pretenses of Edison as anything but the impudent rogueries which they are. His conduct towards Mr. Prescott has involved the basest betrayal of confidence. On the contrary, from the fact being, as he permits his counsel to assert, that a nominal consideration merely has been paid to him, the fact is, as the agreement itself states (a statement which the counsel chose to overlook), that by every original consideration of labor and investment they were equally entitled to the benefit of these inventions. The agreement says: "And whereas said Edison has invented certain improvements in Duplex telegraphs, \* \* \* and said Prescott is entitled to an equal interest in the same, and others hereafter mentioned."

The facilities and expenditures provided by Mr. Prescott have reached many thousands of dollars, and when the inventions were complete, in strict conformity with the original purpose of their association, their inventions were all offered to the Western Union Telegraph Company. During the progress of the negotiations the sum of \$10,000, on account, was paid to them by that company for these specific inventions, and subsequently an offer in writing by them for a fixed price was accepted by that company, in writing.

The trouble is not, as stated at page 12 (brief of counsel for Edison) "that Prescott may hold these inventions if patents are issued to him unused, unsold and unlicensed forever." The trouble is that the parties have jointly sold these inventions already, and have received part payment, but the sale does not suit the purposes of Mr. Jay Gould, who is the sole and only interested party in this appeal. This proceeding is an attempt to enable the roguish inventor to sell three times, and receive three prices for his invention—once to Mr. Welch, in 1869, as shown below, once to the Western Union, and once to Mr. Gould; the last sale having the added beauty, in a rogue's eyes, not only to cheat a former purchaser, but also of cheating his partner of a share of profits. If the interpretation now given to the sale to Harrington were anything but a dishonest and stupid afterthought, the series would be complete, as a quadruplex.

Since counsel for Edison have forced upon the attention of the Secretary, as a part of the record, a document which is not on the record, we suppose we may be at liberty to refer to a document which is on the record, although not referred to heretofore. This is an assignment by Edison to E. Baker Welch, dated April 7, 1869, recorded in the Patent Office, January 30th, 1875, Liber. W. 18, page 18, and which contains the following words:

"I do also hereby agree and bind myself to sell, assign and convey to said Welch, for the considerations before mentioned herein, one undivided half interest in any other instrument, or any other principle, method or system which I may invent, or obtain a caveat or patent for, to be used for the transmission of messages on telegraph lines both ways simultaneously."

"THOS. A. EDISON."

The third sale has, so far as the law will allow, been consummated, against the injunction of the Chancellor of New Jersey to the Atlantic and Pacific Telegraph Company, as will appear by the records of the Patent Office. Assignment of Thomas Edison, by Jay Gould, attorney, to Samuel M. Mills, filed April 10th, 1875, and by Samuel M. Mills to the Atlantic & Pacific Telegraph Company.

The document entitled "Statement of George Harrington," &c., which comes to hand as this reply is going to press, is found on a very hasty reading, to contain a reference to a certain New Jersey suit, and is the occasion for submitting, with this reply, a copy of the bill and injunction in that case.

The action is one to compel specific performance of the agreement of Prescott and Edison to the Western Union Company. As we believe, no answer to the bill has yet been filed.

8. The brief of counsel for Edison, as well as that of counsel for Harrington, avail of the fact that we have cited Edison's acts and declarations as furnishing some evidence of his intentions at the date when he assigned to Prescott, to adduce his acts and declarations, *since that assignment*, in support of that interpretation of the agreement which it is now his interest to sustain.

They seem to be of opinion that the acts and declarations of a party are equally credible, whether made for or against his *existing* interest; and his counsel, with a charming unconsciousness, says, p. 15: "Thus, it will be easily seen why it is for the *interest of Edison* to revoke his request to have these patents issued to Prescott and himself," &c.

To give special point to this part of the argument, they cite the fact that, since making the agreement with Prescott, to wit, in November, 1874, he took out a patent, No. 156,843 (Appendix H, (G?) Edison's brief, p. 49), and had the same issued to himself and Harrington jointly. Knowing all the points of a good argument, and unwilling to abandon any, so long as inventive powers hold out, Edison perceives that this illustration would be much more forcible if the application were made after the agreement with Prescott, and he accordingly asserts that it was so. "After these several contracts and agreements" (those of August 19th and July 9th), "Edison applied for letters patent for a duplex machine, which were at his request issued to him and Harrington jointly (being 156,843, Nov. 17, 1874, Appendix H, Edison's brief, page 10)."

By turning to appendix H (doubtless intended for specifications attached to appendix G, page 49), it will be discovered that, by what we fear is an oversight of some clerk (whose negligence unfits him to serve such a master), the endorsement of the Patent Office upon this specification is left unpunctuated, and informs us that this application, instead of having been filed *after* August 19, 1874, was filed "March 18, 1873." An examination of the specification shows that it is for a *chemical telegraph*; the automatic or fast telegraphy being a chemical system, and the *quadruplex* having no use for such inventions. Besides this Mr. Prescott claims no interest in any of the inventions of Edison *except those described in the assignment to him*, which are certain inventions, applications for patents on which, by specified numbers had been then made, and certain other inventions, drawings of which were then in the hands of the model-maker, with improvements on the inventions conveyed. This invention, patented November 17th, 1874, is not one of those, and we know no reason why it should not have issued to whom-ever Edison nominated.

There is apparently some confusion of ideas among counsel on the other side as to what Prescott claims. Efforts may be made to communicate that confusion to the mind of the Secretary by treating this as if Prescott claimed *all the inventions of Edison which relate to double transmission*. This is not so. We show in our brief filed before the Commissioner that, as early as 1869, Edison had invented, and offered for sale, a "double transmitter." Double transmitters have been known for 20 years; but they were never successful until, in 1872, Stearns patented certain contrivances, and, for the first time, and in connection with this invention, use was made of the term "Duplex," to signify a method of double transmission. The inventions of Edison, in which Prescott claims an interest, are only *those certain inventions specifically described in the assignment of August 19, 1874, and improvements thereon*.

Should the Secretary go so far as to examine the specifications for these certain inventions in which we claim an interest, he will discover that, as already stated, each one of them is for a purpose which would have been impossible before the application to the Duplex of the condenser, and of the Wheatstone Bridge, which were both made in 1872.

Each specification contains references which would have been impossible at the date of the agreements with Harrington. The double transmitter, if equities are to be considered, belongs to Mr. Welch, of Cambridge, Massachusetts, by the old assignment of 1869; though we suppose it would not be pretended by any person, qualified to consider questions of law, that Mr. Prescott's actual title to actual things for which he has paid money and given valuable consideration, is to be affected by that unrecorded executory agreement.

No more is it to be affected by any principle of law known to lawyers by any notice, constructive

or actual (though no actual notice did exist), of the Harrington agreement of 1870. This was an agreement purely executory in its character, being an agreement for work and labor.

The only constructive knowledge of this agreement which could be imputed to Prescott is derived from the recorded agreement of April 4, 1871.

This paper gives notice that, at some former time, Edison "did stipulate and agree to invent and construct for the said Harrington full and complete sets of instruments and machinery."

No intimation is given that that agreement was in writing, or that any inquiry anywhere, from anybody, would lead to its discovery; but, on the contrary, the clear implication from the recorded agreement is that that first agreement *had been performed*.

NOTE.—It is intimated to counsel for Mr. Prescott that, in a private conversation, one of the counsel for Harrington complained of what he said was an omission in the agreement of April 4th, 1871, as printed in our brief before the Commissioner. The omission was said to be of the word "or" between the words "automatic telegraphy" and the words "Mechanical Printers," occurring in the last line of the second paragraph of that agreement. We have had the record examined to see whether our certified copy was correct, and find it to be so. The word "or" does not occur in that place in the record. The point is of some, although not of any great, importance. While speaking of it, however, we call attention to the method of interpreting that agreement adopted by the counsel for Harrington in their brief, at the bottom of page 1. They say, "subsequently, on the 4th of April, 1871, Edison conveyed to Harrington two-thirds in interest of *all Edison's inventions*, including therein all his invention in mechanical or copying printers, and all of the patents for all such inventions and printers, whether already issued or applied for, or to be hereafter applied for, and all his inventions and improvements, made or to be made, that are or may be applicable to *them*."

The pronoun *them* evidently applies to "all Edison's inventions." The statement, when made in that manner, might sustain an argument, that if the inventions, lately assigned to Prescott, are improvements upon any former "inventions" of Edison, they were covered by the language of that agreement. The reading of the language of the agreement will correct that impression. It is precisely as follows: "I, Thomas Edison, \* \* \* do by these presents hereby assign, &c., to him, the said Harrington, two-thirds in interest of all of my said inventions, including therein all my inventions of mechanical or copying printers, and of all patents, &c., whether already issued, applied for, or to be hereafter applied for, and of all and whatsoever of my inventions and improvements made or to be made \* \* \* that are or may be applicable—[not to "*them*"]—to Automatic Telegraphy mechanical printers," or as it is printed in Edison's brief, p. 39, and, perhaps correctly, "Automatic Telegraph Mechanical Printers."

It will be more convenient, from this point, to take up the two briefs in the order of their pages, calling attention to such special things as seem proper for reply:

Beginning with the brief of Mr. Harrington, we have in the preceding note called attention to what we regard as a serious misstatement of the language of the agreement of 1871.

Further down upon that page reference is made to the numbers of the applications for inventions assigned to Mr. Prescott, including No. 99. As this brief is being written, we learn that by some evasion of the decision of the Commissioner of Patents involving, as we now understand, a renewal of a former application, under a different number, and with amended specifications, Edison has succeeded in obtaining from the Commissioner letters patent for the invention described in application No. 99.

This of course will avail nothing to him since he must be held (if Prescott is right in his claim) as trustee for him. But the method adopted is fairly illustrative of the character of the person with whom we have to deal.

Page 3, Harrington's brief—"The sum of one dollar" is here, as elsewhere, referred to as being the only consideration for the assignment to Prescott, there being an entire omission to notice the statement of fact that Prescott (by considerations unnecessary to be stated, and which certainly the parties were free to state or not as they saw fit) was "entitled" to the interest assigned to him.

At page 3 it is said, "Now it is very clear that the conveyance to Prescott, of August, 1874, is wholly inconsistent with the agreement of Harrington and Edison of October 1st, 1870, and April, 1871, provided the subject matter of these instruments is the same, a fact which is denied by Mr. Prescott, and which, of course, is the first thing to be determined."

The language here quoted does not state the issues, but with a slight amendment, would fairly state them. It is a truism, that Mr. Prescott's agreement is inconsistent with the other agreement "provided the subject matter of the instrument is the same;" and it is true that Mr. Prescott denies that they are the same. But the principal question is whether, being in their general language intended to apply to the same general subject matter, viz., telegraphic apparatus, but the later of them applying by specific

description to specific inventions after they had become complete, and the other applying only by general reference to a general class of uses concerning which the inventor thought and hoped he might make inventions; the later and specific conveyance entitles the assignee by that instrument to hold the legal title (subject to such equitable claims as others may possess), or whether the holder of the earlier instrument is entitled to hold the legal title, although at the time he took his agreement, nothing existed to which a title could apply.

The two questions in the case, as it stood before the Commissioner, were:

*First*.—Do the conflicting agreements apply to the same subject matter?

*Second*.—If they do so apply, is not the later agreement a specific assignment, capable to act upon existing things, and convey a title thereto; and are the earlier agreements, any more than executory contracts, incapable to take effect at the time for the want of specific subject matter?

(See Brief for Prescott, before the Commissioner, pp. 31, 5, 7.)

The Commissioner treated these questions as any judicial officer would be compelled to do, by considering the question last stated first. As has been shown, no evidence has been offered, or pretense made, that the specific subject matter, to wit, the specific inventions covered by the later agreement, were in existence when the earlier agreement was made. This being so, he decided in accordance with the authorities, which are uniform and without exception, that the legal title was in Prescott, and that a person holding the legal title should have the *evidence* of the legal title to hold, subject to such higher claims of equity as the courts might impose. The cases cited by counsel for Mr. Harrington, to show that an invention not made or thought of but only desired and wished for, is capable of immediate transfer and assignment, are, by their facts, inapplicable to the facts existing when the Harrington and Edison agreement was made. They are all cases of inventions actually existing, and capable of identification at the time of their assignment, as will be seen upon examination.

1. *NeSmith v. Calvert*, 1 Woodbury & Minot, 41, was a case where purchasers of improved wool carding machines taken with notices of the prior assignment were enjoined in favor of the plaintiffs, who were assignees of improvements upon these machines, the Court saying (p. 41):

"I am satisfied on the other point that the balance of the testimony is in favor of the fact that F. A. Calvert, before maturing his improvements and taking out his patent, in 1841, *had in contemplation, and had considered the further improvement patented in 1843. \* \* \* That the principle of it had occurred to him in 1841, and had been in some degree tested, is quite clear. \* \* \**"

"The idea had occurred to him and had been discussed before his contracts with the complainants" \* \* \* (p. 42).

"The change was rather a further progress in the same machine than inventing a new one, was maturing its form *without introducing any new principle*, was merely withdrawing the angular tooth," &c. (p. 43).

"The improvement in 1842 of what was patented in 1841 is proved, in point of fact, to have been only a further development of ideas entertained in 1841 on the same subject" (p. 43).

2. *Railroad Company v. Trimble*, 10 Wallace, 367, was a case where infringers ought to escape liability to a suit brought by plaintiffs claiming under an assignment of a sectional right in two patents and improvements, for the term of an extension. It was shown that the patentee and his assignee had always treated the assignment as transferring the interest in the extended patent.

The date of making the improvement is not expressly specified, but the Court, referring to *Gaylor v. Wilder*, say: "There is no substantial ground of distinction. The application of the same principle to the assignment of an extended patent, made before the extension, is an inevitable corollary from the reasoning and ruling of the Court. Without in effect overruling that adjudication we cannot hold that Trimble had not legal title under the extended as well as under the original patent" (p. 380).

And the Court refer to the fact in *Gaylor v. Wilder*, that the assignor in that case "had an inchoate right at the time of the assignment, the invention then



being complete and the specification prepared" (10 Wall, 379).

Nicholson Pavement Company v. Jenkins, 14 Wallace, was a case where the assignment was of a sectional right during an extension, and the Court simply held that the terms of the instrument included the extended term of the patent, which had been issued thirteen years before the assignment.

8. It will be seen that in all these cases except *R. R. Co. v. Trimble* and *Nesmith v. Calvert* the inventions assigned had been specifically described at the time of assignment. In *Nesmith v. Calvert*, the judgment is based upon the expressed conviction of the judge that the improvements had, as matter of fact, been made prior to the date in question; and in *R. R. Co. v. Trimble*, the opinion of the Court shows that the facts were the same as in *Gaylor v. Wilder*, where the assignment expressly referred to the specifications as being already signed (10 How., 480).

In the present case the Commissioner of Patents, who has heard this question, has expressly adjudicated upon this question of date that there is no allegation, no evidence, and no reason to suppose, that these inventions were made at the date of the Harrington agreement.

It is not to be forgotten that the agreement of October 1st, 1870, was never put on record in the Patent Office until some time in the month of January, 1875; and it is entirely erroneous to say that Mr. Prescott had any notice whatever of the existence of that agreement.

We are instructed to say that the statement on page 24 of Mr. Harrington's "statement," that he caused Mr. Prescott to be informed, &c., is erroneous. Whatever messages upon that subject Mr. Harrington may have destined for Mr. Prescott he now receives them for the first time.

Page 5, Harrington's Brief.—The brief of counsel says: "The letter of Edison revokes the request, &c., and as patents cannot under the law be granted to an assignee except upon the application of the inventor, it takes away the only ground upon which Mr. Prescott could base his claim."

This suggestion is made with more boldness in the brief of counsel for Edison, and it will be sufficient to reply to both here.

The law requires applications to be made by inventors, because applications are accompanied by specifications which are to distinguish the invention from others, and to limit and specify the exact claim of the inventor as to what he claims to have invented. The policy of this provision, as is well and universally understood, is to require the sworn application to be upon the oath of the person who best knows what he has invented, and who probably can best describe his invention, rather than upon the sworn application of a purchaser, who will be more liable to commit error, and less certain to be accurate in the statement of such particulars. This is the main purpose of this portion of the law. When therefore the application has once been made every purpose of the law-making power is satisfied. The inventor, so long as he stands unembarrassed in his right to do what he pleases with his invention, is customarily permitted to withdraw his application, to renew or change it, but when he has once filed a technical application in pursuance of an agreement by which others are united with him in interest in the letters patent asked for, he has no longer the right except by consent of his co-owners to vary or change the legal status which his application completes. Any other notion than this would involve an immorality repugnant to every instinct of justice and right. The rules of the Patent Office are not made to facilitate acts of bad faith.

Suppose Mr. Prescott had paid \$100,000 for his share in these inventions, would the argument then be made that the inventor, having got his money, could withdraw his application, and substitute another and a new request?

Mr. Edison is at present applying to have patents issued to himself and Harrington, and Mr. Harrington assures us that he has paid large sums to obtain these interests. Are counsel willing to agree that Edison can now withdraw that request and authorize issue of patents to himself alone, or to himself and another purchaser, if still another can be found? Counsel for Edison evidently thinks this can be done. But his moral and legal test of his client's obligations is too plainly dependent on considerations whether the obligation is "onerous" or otherwise, to commend his opinion to very general acceptance (Edison's Brief, pp. 11, 12).

Edison specifically agreed in respect to those inventions for which applications have not yet been filed, that he would execute all the requisite papers, and specific performance of that agreement will be directed by a court of equity, undoubtedly, whenever asked. In the meantime, as to the applications already on the record, they are made. They cannot be changed without our consent, except by an act of gross bad faith, which, we assume, the Patent Office will not assist. Edison now stands upon the records of the Patent Office as having endeavored to sell the same inventions three—and he himself claims—four times. His duty to Mr. Prescott, to take all such measures as are, by technical rule of law, required to be taken in his name, is precisely analogous to the case of those nominal plaintiffs or trustees who are not permitted to deny or withhold the personal action required for protection or furtherance of the interest which they represent.

"It is a general rule that if a trustee or merely a nominal plaintiff, release an action, to the prejudice, and without the consent of the party beneficially interested, the Court will, on motion, set aside the plea and order the release to be delivered up to be canceled."

*Chitty, Contracts*, 861, 10th Am. Ed.

"This Court will not permit a mere nominal plaintiff to release the action, or to enter a retraxit without the knowledge or consent of the real plaintiff" (who was the assignee of a note for the benefit of himself and the assignor, the nominal plaintiff).

*Sloan v. Sommers*, 2 Green, N. J. Law R., 500, head note.

"Burrough, J., observed that in a similar case about ten years before, Lord Eldon, Chief Justice, had holden that no action could be brought in the name of a trustee without his consent; but that if a trustee would not consent to lend his name as a plaintiff the Court of Chancery would, on application, compel him to permit his name to be used; nevertheless, if an action were once commenced in the name of a trustee, he could not afterwards release it, except by leave of the Court."

*Hickey vs. Burt*, 7 Taunton, 48.

"The assignee is to be recognized as the owner, and all acts of the assignor subsequent to its assignment and affecting the validity of the contract are fraudulent. He has no more power over it than a stranger."

*Hackett vs. Martin*, 8 Greenleaf R., 78.

"Where a chose in action is assigned by the owner, he cannot interfere to defeat the rights of the assignee in the prosecution of a suit brought to enforce those rights."

*Mandeville vs. Welch*, 5 Wheaton, 217, head note.

"After an assignment of a chose in action, the assignor will not be allowed to defeat the rights of the assignee, whether the assignment be good at law or only in equity."

*Blin vs. Pierce*, 20 Vermont, 25.

It would have required some boldness in counsel to argue before any of the learned Judges above cited, that a request like this of Edison's, made as a technical but essential incident to a grand title could, like a mere naked request, be revoked at the will of the maker.

Pages 8-9, Harrington's Brief.—It appears that counsel for Edison and Harrington are not agreed upon their remedy. Counsel for Harrington asks a remanding of the case to the Commissioner, while counsel for Edison asks the Secretary to refuse his signature to the patents ordered by the Commissioner to issue.

Page 5, Brief for Edison:

"It would seem hardly within the power of Congress to have enacted that the patent should be issued to any other person than the inventor, because \* \* \* the Constitution gave Congress the power only of securing \* \* \* inventors the exclusive right to their respective discoveries. \* \* \* It has been \* \* \* decided \* \* \* that a patent could not issue for any part less than the whole of the invention."

It is late to suggest a doubt of the validity of patents issued to others than inventors.

The last part of the section cited suggests at once the difficulty in which Mr. Harrington is found under the rules and practice of the Patent Office, which, notwithstanding counsel treats it contemptuously as an "invention," is the law of this case. The regulations of 1873, which, as we suppose, were approved by the Honorable Secretary of the Interior, provided for such a re-adjustment of title in the case of assignment of part interest by an inventor as to make the

parties stand equal in the character of their title. As Mr. Harrington is the only assignee in the interest which he claims, and does not own the whole, it is clear that no patent can issue to him alone or jointly with Edison, under the rules of the office—the one being the assignor and the other the assignee.

Page 6, Edison's Brief.—We concur with the proposition in italics at the bottom of the page, "That the assignee of any part, or of the whole, cannot acquire any interest in a patent to issue without the inventor's concurrence or against his will." Being aware of this at the date of the agreement of August 19th, Mr. Prescott obtained that concurrence, and we have sufficiently stated above our objections to the novel doctrine that such a concurrence made upon good and unimpeached consideration can be withdrawn whenever the obligations involved become "onerous."

Page 7, Edison's Brief:

"Edison, the inventor, &c., filed on the 19th of August, 1874, certain applications for patents for alleged discoveries by him in his specialty, and asked, for reasons controlling him at that time, that patents might be issued to himself jointly with George Prescott, his assignee, and afterwards, to wit, on the 23d of January, George Harrington \* \* \* filed his petition, that said patents should be issued to himself and Edison jointly, and Edison, by his letter of the same day, revoking his request that said patents should be issued to Prescott and himself jointly, asked that patents for his inventions might be issued to himself and Harrington jointly" (all this, also, for reasons controlling him at that time, we suppose).

"For reasons controlling him at that time," he did, as shown above, agree to assign an interest in these inventions conflicting with those claimed by Prescott, Harrington and the Atlantic & Pacific Company, to Mr. Welch; and "for reasons controlling him at THAT time," he again conveyed the same inventions to Mr. Mills, through his attorney, Mr. Gould; and "for reasons controlling him at THAT time," he appeared before the Patent Office, asking that the patents might be issued to himself and Mr. Harrington; and, "for reasons controlling him at THIS time," he now asks that, notwithstanding all former conveyances and requests, the patents should be issued to himself alone.

Page 11, Brief for Edison:

"He does not deny the execution of the several instruments which are of record, but he does deny, in the case of Prescott, the sufficiency of the consideration and the binding effect of the agreement, and desires that they may be tested in a court of equity."

In this respect our desires coincide. The posture in which a court of equity would wish to find the title to these inventions, in order to administer justice in accordance with established forms, would be precisely that fixed by the decision of the Commissioner. Should Mr. Prescott endeavor to prevent the beneficial sale or use of the joint property, a court of equity would appoint a receiver, and cause the property to be administered in accordance with the spirit of the agreement for the benefit of both parties. But, as above remarked, that is not the danger which Mr. Edison, or rather which Mr. Gould fears.

The argument upon this and succeeding pages, that Edison ought to have the whole of these patents, because he has conveyed them to two different people, and is liable to actions by both for his fraud and knavery, is especially commended for its novelty. We have confidence to believe, however, that Mr. Harrington does not intend to proceed to that extremity. If his "false clamor" does not avail now, we think nothing more will be heard of Harrington's claim on Edison for these inventions.

The intimation that the Prescott and Edison agreement constitutes a partnership, determinable at will, is entitled to the same commendation. The idea that one co-owner of property can destroy the other co-owner's interest by dissolving the relation, being entirely unique and entitled to consideration solely on the account above named.

Page 13, Edison's Brief.—At the bottom of this page we are informed that, in the opinion of counsel, an original interest in a thing obtained by concurrence of labor and investment in its production is a "slight consideration." We agree with him that this whole business is "the old, sad case." Considered as related to the human family in general, it is as old as lying, cheating and the betrayal of friends. Considered as specially relating to Edi-

son, it is as old as 1869, the date at which he began, by a conveyance to his friend Welch, the series of conveyances, or attempts to convey these inventions to whoever could be found to pay him money, and trust in him. His inability to refrain from taking the money of successive purchasers is equal to that of his counsel to find a case "where that word *may* has ever been construed, *shall*" (p. 13).

Edison's moral impotency may be beyond cure, but his counsel would be greatly benefited—in respect to the word "*may*"—by a reference to the ordinary text books of the law. We submit, in this connection, one respectable authority, and add, in the appendix, a few others of the many which a clerk has been able within a limited time to copy. If the printer has erred in italicising the word "*may*" instead of the preceding word "*that*," thus causing counsel to appear as referring to the generic word "*may*" when he only meant to refer to that specific combination of types which make the word "*may*" which stands in this statute, we can say that he has the honor of raising the doubt for the first time. At any rate, the discretion, if any exists, is given to the Commissioner who has exercised it, and decided (whether he "*may*" or "*shall*") to issue the patent to the assignee.

A statute provided that certain boards of supervisors of counties owing debts, if the current revenue should be insufficient, "*may, if deemed advisable, levy a special tax* \* \* in liquidation of such indebtedness."

A creditor having obtained a mandamus for such a tax levy, the respondents (the supervisors) brought a writ of error.

Swayne, J., delivering the opinion of the Court, says:

"The counsel for the respondent insists, with zeal and ability, that the authority thus given involves no duty; that it depends for its exercise wholly upon the judgment of the supervisors, and that judicial action cannot control the discretion with which the statute has clothed them. We cannot concur in this view of the subject. Great stress is laid by the learned counsel upon the language, '*may, if deemed advisable*,' which accompanies the grant of power, and, as he contends, qualifies it to the extent assumed in his argument."

In *The King v. The Inhabitants of Derby* (Skinner, 370), there was an indictment against "diverse inhabitants" for refusing to meet and make a rate to pay "the constable's tax." The defendants moved to quash the indictment, "because they are not compellable, but the statute only says that *they may*, so that they have their election, and no coercion shall be." The Court held that "*may*, in the case of a public officer, is tantamount to *shall*, and if he does not do it he shall be punished upon an information, and though he may be commanded by a writ, this is but an aggravation of his offense."

In *The King and Queen vs. Barlow* (2 Salkeld, 609), there was an indictment upon the same statute, and the same objection was taken. The Court said: "When a statute directs the doing of a thing for the sake of justice or the public good, the word *may* is the same as the word *shall*;" thus 23 Hen. VI. says, the sheriff *may* take bail. This is construed he *shall*, for he is compellable to do so."

These are the earliest and the leading cases upon the subject. They have been followed in numerous English and American adjudications. The rule they lay down is the settled law of both countries.

In *The Mayor of the City of New York* (3 Hill, 614), and in *Mason v. Pearson* (9 Howard, 248), the words "it shall be lawful" were held also to be mandatory.

The conclusion to be deduced from the authorities is, that where power is given to public officers, in the language of the act before us, or in equivalent language—whenever the public interest or individual rights call for its exercise—the language used, though permissive in form, is in fact peremptory. What they are empowered to do for a third person the law requires shall be done. The power is given, not for their benefit, but for his. It is placed with the depository to meet the demands of right, and to prevent a failure of justice. It is given as a remedy to those entitled to invoke its aid, and who would otherwise be remediless.

In all such cases it is held that the intent of the Legislature, which is the test, was not to devolve a mere discretion, but to impose "a positive and absolute duty."

*Supervisors v. U. S.*, 4 Wallace, 435, cited and followed in *City of Galena v. Amy*, 5 Wallace, 709.

Page 16, Edison's Brief.—We do not object to the questions stated at the bottom of the page.

Had anybody suggested to the Commissioner that the deed of assignment was not genuine, or that it was procured by fraud or duress, or that it had been lawfully canceled or annulled, doubtless he would have listened to such proof. Indeed, the question which he asked the then counsel for Edison as to their pretenses in this respect covered all these conditions, and there was no claim by them that the deed was not genuine, or that it was procured by fraud or duress, except the same general suggestion which we have in the brief of unconscionableness, or that it had been lawfully canceled and annulled, otherwise than by the revocation which was on record, and which the Commissioner *did* consider.

The succeeding pages of argument upon the Commissioner's asserted refusal to hear evidence are entirely answered by the statement that there was no such refusal; and the discussion is all gratuitous.

*The record of caveats, as already shown by us above, proves that none of the inventions now in question could have been conceived of until after the year 1872.*

In this view of the case the Commissioner spoke with great moderation when he said, after asserting that no evidence of a prior date of invention was offered or pretended to exist, that the probabilities were against such prior invention. We again observe that it is the present counsel for Edison, who did not attend the hearing before the Commissioner, whose information appears most complete and positive as to what the Commissioner refused. That happy confidence which enables him to believe himself when he says, "It is true 'Voltaire says that the balancing of probabilities is the science of judges'" also enables him to be quite certain upon a point of which he has no knowledge, and upon which those counsel with him, who have knowledge, are prudently silent.

Page 21, Edison's Brief:

"This could be determined by the record alone, if, AS THE COMMISSIONER ADMITS, 'the deed of Harrington includes these inventions in unmistakable terms.'"

How can we rely upon the statement above of what Voltaire said, when we find that in citing last month's published opinion of the Commissioner, he is represented as admitting a thing which he expressly refused to consider or pass upon?

What the Commissioner substantially said was, that admitting, for the sake of argument, as is not unusual, a certain fact, still the fact does not avail the party asserting it. We fear that the counsel intended the Secretary to believe, when he read the paragraph on page 21, that upon the question of whether the two deeds cover the same inventions, the Commissioner had decided that they do.

Page 22, Edison's Brief.—Counsel here complains that the learned Commissioner has not sustained a certain portion of his opinion by any authority, and submits "that it is now well settled that an inventor may convey an interest in his invention \* \* \* before the discovery has come to him." Perhaps a point so "well settled" does not require citation of authority, but still it would have been gratifying had counsel for Edison found it convenient to cite a reported American or English case, for this, to us, entirely novel proposition. The only authority cited we understand to be the Spanish case of Ferdinand and Columbus, which, counsel informs us, was, that Ferdinand granted to Columbus a portion of the new world, before Columbus discovered it. We submit that the case is not precisely in point, since the assignor did not pretend to assign anything which he himself was to discover, but only that which the assignee might discover. The history of that business is of little value as an authority upon questions arising under our Statutes; but for other uses, including the instruction of the juvenile mind in early American history, it has some interest; and this causes regret that, by its inclusion among the careless quotations and references of that brief, doubt should be cast upon what has heretofore been regarded as an authentic historical fact.

Page 22, Edison's Brief.—The understanding of counsel of the case of Nesmith v. Calvert seems somewhat obscure. According to that understanding, where an inventor has made a machine and contemplated that he might make further improvements upon his invention, and made a deed conveying his improvements thereafter to be made, a court of equity will, when a patent is issued, "compel him to make the conveyance because the title had passed to the assignee."

If we understand it, a conveyance is no longer necessary when the title has passed. We presume that a court of equity will decline to occupy its processes and its time in confirming that which is already perfect. What a court of equity will do is to compel that person who possesses a title which he ought not to possess, to transfer it to that person who does not, but who ought to possess it. If Mr. Prescott becomes possessed inequitably of the legal title by the issue of patents in accordance with the ruling of the Commissioner, Mr. Harrington, or rather the Atlantic & Pacific Telegraph Company, are not harmed, for they can compel him to transfer to them that which it is wrong for him to retain, and right for them to demand; and we again would repeat that for the purposes of equity, the situation in which the Commissioner's decision, if carried out, will put these disputed titles, is that in which a court of equity would desire to find them, and the best which the practiced professional judgment could devise to protect most efficiently all rights, and avoid most certainly all causes of injury.

Page 25, Brief for Edison.—The patent referred to, Appendix G, is that already discussed above, to wit, a chemical patent, to which Mr. Prescott has never made any claim.

Upon the same page counsel refers to the citations of telegraph literature in the brief for Mr. Prescott, which was laid before the Commissioner of Patents. That brief was printed before the ruling of the Commissioner upon the point made by the counsel for Harrington, limiting the case before him to the record. After that, of course the Commissioner did not consider any of the matter there printed. It is, perhaps, unnecessary to say in respect to the last clause on page 25, that the "TELEGRAPHER" is not "the newspaper organ of the Western Union Telegraph Company;" but, on the contrary, has always been its persistent critic and enemy. To call the *Telegrapher* a friend or organ of the Western Union Telegraph Company, in the presence of any telegraph man, would certainly cause a smile.

Page 26, Edison's Brief.—The questions submitted to the Secretary enlarge as the brief of counsel goes on, and we find, at the bottom of this page, the subject treated as if the Secretary were authorized by law to inquire into the unconscionableness of the consideration for the assignments of patents. This, certainly, is the largest jurisdiction which could be suggested, and the advocate of this jurisdiction will perhaps be able to cite some provision of law from which it can be fairly supposed to arise.

The entire brief of counsel for Edison consists of two principal points:

*First*.—Misstatement of the action of the Commissioner, and an elaborate argument, based on that misstatement, which is instantly and completely neutralized by a correct understanding of the fact.

*Second*.—An elaborate appeal to the Secretary to allow Edison to cheat Prescott in order that he may avoid an action of damages by Harrington.

A careful reading of that brief will discover no other substantial matter in it; and throughout the whole will be found evidence of an utter incapacity in Edison to distinguish right from wrong, and in his counsel to perceive any reason why he should not present to a Government minister as good reason for official action, the consideration that his client's "interest" is, to be rid of contract obligations, assumed "for reasons controlling him at that time," but which have since become "onerous."

ROSCOE CONKLING,  
GROSVENOR P. LOWREY,  
J. HUBLEY ASHTON,  
Of Counsel for Mr. PRESCOTT.

## APPENDIX.

### COMMISSIONER'S DECISION.

*Thomas A. Edison.—Question of Title.*

[In the matter of the application of Thomas A. Edison, assignor, &c., Nos. 94, 95, 96, 97, 98, 99 and 100, for Letters Patent for alleged "IMPROVEMENTS IN DUPLEX TELEGRAPHS," filed September 1, 1874.—Decided March 20, 1875.]

In determining to whom a patent shall issue, where assignments have been made, the Commissioner of Patents must be governed by the record. He cannot regard mere equitable claims, but must issue the patent to the person or persons having the legal title, the requirements of the office having been complied with.

An instrument purporting to carry inventions not

yet *in esse* is not an assignment, but only an executory contract.

An applicant is estopped from contradicting his deed of assignment, but an estoppel by deed arises alone upon a recital of a particular fact.

It would seem that where, in enforcing specific performance of a contract to assign an interest in a future invention, equity may (after the invention has been perfected and patented) carve out an undivided interest in the patent, a valid assignment to a third party will afterwards take effect upon the interest remaining in the patentee.

THACHER, Commissioner :

Prior to the filing of these applications, the following assignment was sent to the Patent Office and recorded August 29, 1874, in Liber K<sup>1</sup>, p. 62, Transfers of Patents.

Articles of agreement made and entered into this nineteenth day of August, A. D. 1874, by and between Thomas A. Edison, of Newark, in the State of New Jersey, and George B. Prescott, of the City and State of New York, witnesseth, &c., &c.

In accordance with this assignment the applications were entered in the office, as made, by "Thomas A. Edison, assignor of one-half his right to George B. Prescott, of New York City;" and, under the usual practice of the Patent Office, the patents would have been issued, in accordance with the request contained in the assignment, to Edison and Prescott, as assignees of Edison. Before the examination of the applications had been completed, George Harrington presented to the Commissioner of Patents a petition, bearing date January 23, 1875, praying that the patents might issue to Edison and himself, as assignees of the former, on the ground that the following assignment, recorded May 6, 1873, Liber U<sup>1</sup>, p. 412, Transfers of Patents, conveyed to him an interest in these inventions.

Here follows agreement of April 4th, 1871 :

A letter of even date with this petition was also received from Edison, stating that the assignment to Prescott was made under an erroneous impression, and requesting the issue of the patents to Harrington and himself.

The issue before the Commissioner is, to whom shall the patents be granted? In determining this question, the Commissioner must be guided entirely by the record. He has not the authority of a court to consider evidence, outside the record, as to outstanding equities. The only question that he can decide is, who on the record possesses the *legal* title to these inventions? He must issue the patents accordingly. If the requirements of the office, in such cases provided, have been complied with.

In the investigation of this matter, I have come to the conclusion that it is not necessary for the Commissioner to determine whether the assignment from Edison to Harrington, dated April 4, 1871, covers these inventions or not. However this question may be decided finally, there is no evidence that the inventions described in these applications were in existence at the time this instrument was executed. It is not even claimed by Harrington that they were. He simply says that there is no evidence they were not then in existence. But in a court of equity, one of the first requirements made of Harrington would be to prove affirmatively that Edison had perfected these inventions when he executed the assignment of April 4, 1871. In the absence of such proof the probabilities must guide. These are all against the existence of the inventions at that time. The applications were filed more than three years after the date of the assignment. The first record made by Edison in the Patent Office in any way connected with these inventions, was some time in 1873, when he filed his first caveat relating to duplex telegraphy. It is also worthy of notice in this connection that Edison is a very fertile inventor, as the great number of patents obtained by him within the last few years conclusively shows. The present applications extend a series, commenced not long ago, to the number of one hundred. It must be remembered, too, that there has been great activity in inventions relating to telegraphy for a number of years past, and sharp competition has existed between inventors of various improvements. It is incredible, under these circumstances, that an inventor like Edison should allow such valuable improvements to lie three or four years after completion without applying for patents. In the absence of positive evidence on this point, I must follow the presumption, which, in this instance, is so strong as to amount almost to a certainty, that the inventions

described in these applications were not *in esse* when the agreement was made between Edison and Harrington. Admitting, then, that this deed includes these inventions in unmistakable terms, no legal title in them passed thereby to Harrington; the instrument has the force only of an executory contract. (*Gibson vs. Cook*, 2 Blatchf., 144; *Curtis on Patents*, 4th Ed., sec. 183, Note 2, p. 206.)

The legal title to these inventions, then, was entirely in Edison at the time he executed the assignment to Prescott, and he alone had the right to convey any interest in the inventions or patents granted therefor. This right he exercised with all due formality when, in 1874, he conveyed an entire half-interest in the inventions to Prescott. Whether this was done in violation of an outstanding contract is not material to the present discussion. Prescott became the legal assignee of Edison, and, upon the execution of the assignment of 1874, Edison and Prescott became the possessors of the legal title to the entire inventions. This conclusion is controlling in effect, for Edison is estopped from contradicting his deed of assignment to Prescott. It is hardly necessary to cite authorities on this point, and I will only refer to *Van Rensselaer vs. Kearney et al.*, 11 How., 297, and *Bowman vs. Taylor*, 1 Webster's Patent Cases, 292.

It may be alleged, however, that the same doctrine should be applied to the deed of Edison to Harrington of 1871, and that then the rule that an "estoppel against an estoppel setteth the matter at large" would operate. But an estoppel arises alone upon a recital of a particular fact. Speaking of a mortgage deed, "There is," said Lord Tenderden, delivering the judgment of the court in *Doe d. Jeffreys vs. Bucknell*, 2 B. and Ad., 278, "a want of that certainty of allegation which is necessary to make it an estoppel." Lord Holt lays it down in *Salby vs. Kidley*, 1 Show., 59, that "general recital is not an estoppel, though recital of a particular fact is." (*Doe vs. Oliver*, 2 Smith's Leading Cases, Hare & Wallace's Notes, 7th Am. Ed., 656.)

The deed in question does not point out, either by recital or description, any particular invention or patent. It is vague in its terms and executory in its nature, and, for the latter reason, as well as for its uncertainty, an estoppel cannot be considered as arising thereupon. (*Doe vs. Oliver*, *Ibid*, 673.)

The discussion of this case might rest here, I believe, with perfect certainty that, if the necessary formalities have been observed, the Commissioner must necessarily order the patents to issue to Edison and Prescott. But I am still more strongly confirmed in this opinion by the fact, as I believe, that Prescott is the owner of *some* interest in the inventions, whatever effect may be given to the Harrington contract. If a court of equity shall hereafter carve out a two-thirds interest in the patents granted and give it to Harrington, the deed of Edison to Prescott will still take effect upon the lesser interest, if the grantee chooses to enforce it. (*1 Sugden on Vendors*, 347; *Brown vs. Jackson*, 3 Wheaton, 453; *Waters vs. Travis*, 9 Johns., 450; *Turnbull et al. vs. Weir Plow Co.*, 7 OFFICIAL GAZETTE, 173.) Whether in this contingency Prescott can enforce the contract to the full extent of the one-third interest remaining in Edison, or whether the terms and conditions of the grant are such that it can be enforced only to the extent of one-half Edison's remainder, is immaterial. Upon the record before me, Prescott, in my opinion, has an indefeasible right to *some* interest in the inventions described in the applications. This fact makes the necessity of joining Prescott with Edison as the sole possessors of the *legal* title to the invention still stronger.

The only question left is to determine whether in the assignment to Prescott such formalities have been observed as will authorize the Commissioner to issue patents to Edison and Prescott, as assignees of the former. On this point it is only necessary to say that the assignment is in the very words of the form which has been sent out by the Patent Office for years past, in its annual edition of "Rules of Practice." The practice has been invariable in such cases to issue the patents to the assignees, whenever assignments in this form are put on record prior to the issue. I see no reason whatever for departing from this rule in this instance. In the absence of any decision by a higher tribunal invalidating patents thus granted, I think the Commissioner should follow the practice which, so far as my knowledge extends, has never been questioned heretofore.

The applications are remanded to the Principal

Examiner, and, when ready for issue, the patents will be granted to Edison and Prescott, assignees of Edison.

### CURIOUS MAGNET.

In the year 1607 Galileo wrote to a friend about a wonderful magnetic stone, one property of which was that the same pole would both attract and repel the same piece of iron. At a distance of four or five finger lengths, it attracted the piece, but at a distance of one finger length it repelled it. He found, on examination, that the piece of iron was magnetized steel. In a note to the French Academy, M. Jamin says he is able to produce the phenomenon in a quite intelligible way. He magnetizes a bar to saturation with a current producing (say) *austral* magnetism. Then with an inverse current he communicates the certain amount of boreal magnetism, less than the austral, and leaving some of it in the deeper parts. Then he dissolves the steel with acid, which gradually removes the boreal layers, and, ere long, discloses the austral. Now, the latter are not disclosed equally all over; they make their first appearance at the extremity, on the edges and corners, the boreal layers still occupying most of the surface, and (in contrariety to the latter) they have great tension, but small magnetic moment. Suppose, now, the austral pole of a magnet to approach. While it is still distant, it is subject to the predominating effect of the boreal layers of the bar, and is attracted. But when brought quite near the extremity, the austral points gain the predominance and there is repulsion, thus matching Galileo's mysterious stone (which, somehow or other, got lost).

### BEEFSTEAK ELECTRICITY.

The six Christmas lectures for juvenile listeners at the Royal Institution were delivered by Dr. J. H. Gladstone, F. R. S. He chose for his subject, "The Voltaic Battery." One of the experiments revealed a fact not generally known. He said that in daily life weak electrical currents are at work where their presence is little suspected; for instance, supposing a person at dinner to have a silver fork in one hand and a finger upon the steel part of the knife held in the other, it follows that, when he plunges the knife and fork into a beefsteak, two dissimilar metals are thereby placed in a moist-conducting substance; consequently a voltaic circuit is formed and an electric current flows through the body of the individual between the knife and the fork. To prove that this was really the case, he connected a reflecting galvanometer with the knife and fork by means of wires; he then proceeded to cut a beefsteak, and the current thus generated deflected the needle of the galvanometer, so that the spot of light which it reflected was seen traveling along the screen by all the observers.

### WHERE GUTTA PERCHA COMES FROM.

During the year ended June 30, 1874, there was imported into the United States, free of duty, 14,191,320 pounds crude india rubber and gutta percha, valued at \$6,196,729, as follows:

From Brazil .....	6,880,185 lbs.
" Central American States .....	166,672 "
" France .....	30,722 "
" England .....	930,097 "
" Quebec, Ontario, etc .....	1,726 "
" British West Indies & Honduras .....	367,693 "
" British East Indies .....	928,728 "
" British Possessions in Africa .....	11,512 "
" Other British Possessions .....	88,233 "
" Mexico .....	72,963 "
" Dutch East Indies .....	37,958 "
" United States of Colombia .....	4,526,848 "
" Venezuela .....	4,846 "
" Other countries .....	146,137 "



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, June 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Cunningham, Ala., changed to New Castle.  
Hereafter the "tariff for other lines" from San Diego, Cal., to Camp Lowell, Arizona, will be 75 and 8.  
Ashpee Bay, C. B. I., closed.  
Ingonish or Ingoniche, C. B. I., closed.  
Mabon, C. B. I., closed.  
Whycocomagh, C. B. I., closed.  
Slaghts, Col., closed.  
Pilatka, Fla., closed. Until further notice business can be mailed from Jacksonville.  
The P. O. A. of Milton, Ill., is Humbolt.  
Henryville, Ind., closed.  
La Fontaine, Ind., closed.  
Summit Sta., Mich., given in tariff book on other lines, is in Monroe Co.

The P. O. A. of Summit, Ogemaw Co., Mich., is Summit, Custer P. O.

Nunica Junction, Mich., closed.  
Sixty-two Mile Siding, Miss., reopened.

Messages taken for Springville and Boston, Erie Co., N. Y., are delivered by stage leaving Hamburg, N. Y., at 4.20 P.M., daily. Charges for delivery, 25 cents.

Messages for Marion, Pultneyville and Walworth, N. Y., are delivered by stage, leaving Palmyra, N. Y., at 4.30 P.M., daily. Charges for delivery, 15 cents.

Concord, Thomasville and Lexington, N. C., are now other line offices, "tariff for other lines," 40 3, 25 2, and 30 2, respectively, from Greensboro.

Business for Hopewell, N. J., will hereafter be checked direct.

Pelham, N. C., closed.  
Reidsville, N. C., closed.  
York, O., is now a Western Union office, square 180; check direct.

Summit Hill, Carbon Co., Pa., reopened.  
Clarendon Springs, Vt., reopened.  
Amelia C. H., Va., closed.  
Barksdale, Va., closed.  
Boston, Va., closed.  
Chula, Va., closed.  
Clover, Va., closed.  
Coalfield, Va., closed.  
Drakes Branch, Va., closed.  
Jetersville, Va., closed.  
Keysville, Va., closed.  
Meherrin, Va., closed.  
News Ferry, Va., closed.  
Powhatan, Va., closed.  
Roanoke, Va., closed.

## NEW OFFICES.

285 New Castle, Ala. (formerly Cunningham).  
\* College City, Cala., 25 +10 from Colusa.  
Gilroy Hot Springs, Cala.  
\* Glenbrook, Lake Co., Cala., 25 +10 from Colusa.  
\* Kellogg, Cala., 25 +10 from Colusa.  
\* Lower Lake, Cala., 50 +25 from Colusa.  
Litton Springs, Cala.  
Santa Ana, Cala.  
San Quentin, Cala.  
Tahoe City, Cala.  
598 Grant, Col.  
317 Munster, Ill.  
329 Villa Ridge, Ill.  
249 Chase, Ind.  
376 Brush Creek, Iowa (will be open June 15).  
Glenbrook, Nev.  
5 St. Margaret's Bay, N. S.  
180 Lake, O.  
159 Middlefield, O.  
181 Coulterville, Pa.  
151 West Alexander, Pa.  
104 Rapidan, Va.  
† For each additional five or fraction of five words.

## ATLANTIC CABLE BUSINESS.

## REDUCTION OF RATES.

(Reprinted from JOURNAL of April 15th, 1875.)

On and after May 1st, 1875, the tariff for Atlantic

Cable messages to Great Britain, Ireland and France will be as follows:

Note.—The 10-word minimum on business to or from Great Britain, Ireland and France is abolished.

For each  
word, in  
gold.

From New York City and all points in Nova Scotia, New Brunswick and New England States..... 50 cts.  
From all points in New York (except New York City), New Jersey, Pennsylvania, Delaware, Maryland and District of Columbia..... 53 "  
From all points in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan and Wisconsin, from St. Louis, Mo., and from Western Union Company's offices in Florida..... 65 "  
From all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dacotah, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada, California, Arizona, Oregon and Washington Territory..... 70 "  
British Columbia..... 85 "

NOTE.—The rates to points beyond France, which have heretofore been computed by adding to the rate for ten words to London (or to France) will now be found by computing the rate by word to London, and then adding the rate beyond given in the tariff book. Thus: A message of 5 words from New York City to Germany will be \$2.50 to London, and \$1.10 London to Germany, total \$3.60. At present the rate (on a 5-word message) is \$10 for ten words or less to London, and \$1.10 for 20 words or less London to Germany, total \$11.10.

In addition to the foregoing please note the following:

The words "Express from," "Reply — words paid," "Repetition from," and "Acknowledgment paid," will not be counted or charged for in messages to or from Great Britain and Ireland. In messages to or from points beyond Great Britain, the words above referred to will be counted and charged for from the originating office to destination. All orders to the contrary are hereby revoked.

We are notified of the following rates for 20 words or less from London to points in South America:

Chili..... \$67 50  
Uruguay (except Montevideo)..... 60 40  
La Plata (except Buenos Ayres)..... 62 60

The words "Care Oldham" are no longer necessary in messages to South America.

Code and cipher messages can now be accepted for Greece.

## CUBA CABLE BUSINESS.

In messages for the Island of Porto Rico, the name of the town to which the message is destined must be inserted and charged for.

WILLIAM ORTON, President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, May 25, 1875.

On and after June 7th Canajoharie, N. Y., and Phoenix, N. Y., will be added to the list of money order offices in S. B. Gifford's district.

GEO. H. MUMFORD,  
Vice Pres.

EXECUTIVE OFFICE,  
New York, May 26, 1875.

On June 1st, Money Order offices will be established at the following named points in S. S. Garwood's district: Cape May City, N. J.; Atlantic City, N. J.

On June 7th, Newark, N. J., will be added to the list of offices "specially authorized."

GEO. H. MUMFORD,  
Vice-Pres't.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

NEW YORK, May 27, 1875.

## ASSESSMENT No. 75.

4, 5, 23, 28, 33, 46, 53, 54, 55, 60, 61, 64, 65, 67, 72, 77, 86, 88, 89, 90, 91, 93, 108, 114, 121, 134, 186, 139, 140, 141, 142, 143, 144, 145, 148, 153, 157, 176, 177, 179, 181, 183, 184, 201, 202, 215, 218, 220, 235, 244, 247, 254, 257, 267, 269, 273, 276, 290, 294, 301, 302, 328, 346, 347, 349, 351, 352, 353, 367, 371, 372, 378, 379, 390, 393, 395, 391, 394, 398, 402, 405, 406, 413, 416, 425, 430, 431, 434, 463, 467, 509, 526, 532, 536, 542, 546, 547, 548, 552, 553, 554, 561, 564, 576, 577, 586, 587, 592, 597, 603, 604, 615, 649, 659, 671, 672, 685, 690, 692, 694, 708, 709, 717, 729, 731, 734, 735, 740, 750, 751, 756, 764, 766, 769, 772, 799, 808, 808, 815, 825, 830, 831, 843, 855, 874, 886, 901, 915, 916, 917, 922, 923, 933, 941, 943, 976, 977, 978, 991, 995, 998, 1001, 1005, 1013, 1023, 1028, 1039, 1040, 1047, 1064, 1065, 1072, 1081, 1085, 1088, 1090, 1099, 1126, 1134, 1135, 1136, 1143, 1144, 1147, 1167, 1173, 1175, 1177, 1183, 1193, 1194, 1200, 1202, 1208, 1224, 1227, 1227, 1251, 1252, 1260, 1266, 1276, 1277, 1282, 1292, 1294, 1295, 1300, 1304, 1306, 1325, 1329, 1345, 1353, 1354, 1355, 1356, 1358, 1364, 1365, 1368, 1376, 1394, 1402, 1403, 1404, 1409, 1410, 1440, 1444, 1453, 1454, 1455, 1456, 1484, 1485, 1498, 1504, 1505, 1506, 1507, 1508, 1517, 1518, 1532, 1534, 1537, 1532, 1550, 1554, 1555, 1560, 1568, 1569, 1571, 1579, 1582, 1589, 1593, 1594, 1615, 1626, 1630, 1635, 1656, 1658, 1672, 1681, 1685, 1697, 1698, 1707, 1708, 1721, 1723, 1728, 1735, 1745, 1778, 1775, 1778, 1790, 1791, 1810, 1811, 1812, 1815, 1817, 1830, 1831, 1847, 1852, 1869, 1881, 1894, 1901, 1911, 1913, 1914, 1916, 1919, 1938, 1942, 1943, 1944, 1950, 1957, 1964, 1965, 1970, 1985, 1991, 1995, 2019, 2021, 2026, 2027, 2028, 2030, 2036, 2044, 2049, 2057, 2061, 2063, 2065, 2082, 2097, 2113, 2114, 2119, 2133, 2136, 2138, 2161, 2147, 2159, 2162, 2172, 2174, 2175, 2178, 2180, 2181, 2182, 2191, 2194, 2195, 2196, 2197, 2199, 2201, 2202, 2203, 2204, 2205, 2206, 2212, 2214, 2216, 2221, 2223, 2224, 2228, 2229, 2233, 2239, 2241, 2243, 2244, 2254, 2259, 2263, 2268, 2269, 2285, 2286, 2297, 2298, 2309, 2310, 2312, 2321, 2330, 2331, 2333, 2334, 2335, 2337, 2338, 2343, 2345, 2346, 2348, 2350, 2351, 2354, 2358, 2363, 2364, 2365, 2371, 2374, 2386, 2387, 2392, 2395, 2412, 2413, 2414, 2415, 2416, 2424.

## ASSESSMENT No. 74.

6, 26, 31, 39, 52, 70, 84, 97, 98, 101, 112, 120, 154, 156, 158, 160, 164, 171, 175, 189, 190, 191, 193, 197, 198, 206, 227, 228, 230, 248, 252, 316, 323, 334, 341, 350, 356, 357, 360, 362, 364, 366, 382, 392, 393, 411, 418, 426, 441, 476, 481, 482, 484, 511, 512, 527, 545, 556, 557, 573, 575, 584, 580, 600, 618, 642, 646, 648, 652, 655, 662, 663, 664, 665, 669, 701, 710, 712, 722, 723, 724, 725, 730, 780, 781, 783, 785, 786, 790, 802, 809, 812, 813, 820, 822, 836, 838, 842, 869, 876, 897, 899, 904, 905, 906, 908, 920, 926, 929, 931, 944, 949, 954, 957, 959, 963, 964, 979, 980, 1000, 1002, 1005, 1014, 1016, 1030, 1031, 1038, 1034, 1041, 1046, 1050, 1057, 1063, 1069, 1080, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1131, 1139, 1141, 1149, 1152, 1191, 1196, 1210, 1211, 1217, 1233, 1234, 1248, 1251, 1255, 1256, 1268, 1269, 1273, 1274, 1281, 1283, 1284, 1285, 1286, 1288, 1289, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1366, 1375, 1385, 1390, 1391, 1406, 1408, 1407, 1415, 1417, 1421, 1426, 1427, 1428, 1430, 1432, 1433, 1448, 1457, 1458, 1465, 1469, 1471, 1474, 1476, 1481, 1483, 1497, 1513, 1528, 1529, 1530, 1537, 1542, 1546, 1558, 1559, 1573, 1576, 1586, 1588, 1597, 1610, 1611, 1612, 1616, 1620, 1649, 1666, 1667, 1673, 1676, 1678, 1684, 1687, 1688, 1696, 1700, 1701, 1702, 1704, 1709, 1710, 1713, 1714, 1718, 1724, 1733, 1737, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1769, 1771, 1785, 1788, 1789, 1798, 1799, 1802, 1813, 1828, 1837, 1838, 1839, 1840, 1841, 1857, 1858, 1859, 1860, 1863, 1864, 1877, 1889, 1895, 1917, 1922, 1926, 1951, 1972, 1973, 1982, 1982, 1993, 1996, 1997, 2004, 2007, 2010, 2012, 2015, 2022, 2023, 2024, 2033, 2035, 2038, 2041, 2050, 2053, 2069, 2072, 2074, 2075, 2085, 2086, 2092, 2095, 2108, 2112, 2130, 2136, 2137, 2141, 2142, 2145, 2154, 2156, 2157, 2171, 2183, 2184, 2185, 2200, 2211, 2215, 2217, 2220, 2225, 2226, 2227, 2230, 2231, 2234, 2237, 2238, 2245, 2246, 2248, 2250, 2252, 2258, 2261, 2262, 2265, 2266, 2267, 2268, 2271, 2273, 2279, 2281, 2282, 2283, 2284, 2286, 2292, 2293, 2299, 2300, 2301, 2303, 2304, 2305, 2307, 2313, 2314, 2316, 2317, 2323, 2324, 2325, 2326, 2327, 2339, 2342, 2349, 2357, 2361, 2366, 2369, 2372, 2374, 2375, 2376, 2377, 2379, 2380, 2381, 2388, 2389, 2390, 2391, 2398, 2401, 2408, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412.

## ASSESSMENT No. 73.

185, 186, 187, 232, 240, 565, 695, 697, 705, 848, 871, 927, 939, 1058, 1063, 1071, 1198, 1241, 1307, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1336, 1372, 1400, 1437, 1438, 1500, 1501, 1515, 1536, 1537, 1570, 1590, 1613, 1670, 1722, 1727, 1735, 1796, 1797, 1804, 1823, 1824, 1854, 1924, 1945, 1946, 1947, 1969, 1987, 2110, 2123, 2125, 2151, 2236, 2339, 2391, 2352, 2370.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

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Address—

**JOURNAL OF THE TELEGRAPH,**

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, JUNE 1, 1875.

### THE FRANKLIN LEASE ANNULLED.

The lease whereby the Atlantic and Pacific Telegraph Company sought to absorb the lines of the Franklin Company has been annulled and canceled, and the control of the Franklin property has been restored to its rightful owners. It will be remembered that certain of the directors of the Atlantic and Pacific Company acquired, as a matter of private business (as they claimed), a majority of the stock of the Franklin Company, and turned it over to themselves as managers of the Atlantic and Pacific. A special meeting of the Franklin stockholders was called, and at that meeting the Atlantic and Pacific Company, voting on a majority of the stock, leased to themselves the Franklin property for a term of ninety-nine years at a nominal rental—much less than was offered by other parties. The holders of the minority of the Franklin stock, a majority in number, carried the matter into the courts, when the Atlantic and Pacific Company, foreseeing defeat, canceled the lease.

The petition of the Franklin stockholders for the appointment of a receiver and a sale of the property, in consequence of alleged frauds on the part of the Atlantic and Pacific Telegraph Company, will be heard before Judge Morton, of the Supreme Court of Massachusetts, at an early day.

The *Faraday* and the direct cable have been heard from. She had found the deep sea portion which was abandoned last Fall, and laid additional cable to bring it to within twenty miles of the shore end, which is buoyed at a point some ninety miles from Rye Beach. Then she again buoyed it and left for Sidney, Cape Breton, where she is now supposed to be.

### THE ANNUAL REPORT OF THE BRITISH TELEGRAPHS.

From the annual report of the Post-Office Department of Great Britain, just rendered to Parliament, we gather that the total receipts for telegraph service for the year ended March 31st, 1875, was \$5,600,000, and the expenditures for the same, \$5,965,300, showing a net loss of \$365,300. The Chancellor of the Exchequer, referring to the telegraphs, in his speech on the "budget," took a rather gloomy view of what he termed a "remarkable experiment," and held the results up before the House as a warning not to enter into any other kind of business which could better be carried on by private enterprise. He said:

"Undoubtedly the telegraph service has not yet been brought into a remunerative condition. We are not as yet paying our way, and are contributing very little toward the interest on the debt incurred for the purchase. The difficulties under which we have to administer service of that kind—a service which interests everybody, and which leads to demands being made in all directions—are very great indeed. I know very well that honorable members are continually pressed by their constituents to bring forward complaints that for years telegraphic communication is not afforded to this, that, or the other portion of the kingdom, and they are very reluctant indeed to accept the answer that the Government cannot afford to give it. This is a point worthy of consideration, not so much in regard to the telegraph service itself, in which we are now fairly embarked, and of which we must make the best we can, as in reference to suggestions of acquisitions of other forms of property, and the conduct of other kinds of business, in which I hope the House will never be led to embark without very carefully weighing the results of this remarkable experiment." [Cheers.]

The telegraphs of Great Britain have already cost that Government about \$60,000,000, and there are claims still pending which amount to several millions more. Every year the deficiency has been enormous, to say nothing of the loss of interest upon so vast a sum. This latter item alone, at the low rate of 3½ per cent., amounts to \$2,100,000 yearly. At the prevailing rate of interest in this country, 7 per cent., this loss would, of course, be twice as great. All of this has to be met, and there is but one way to meet it—by increased taxation. In this manner the burden of affording telegraphic facilities at less than cost for the one per cent. of the population whose business necessitates their use falls upon the ninety-nine per cent. which does not use the telegraph at all.

These difficulties, so serious to Great Britain, are but a bagatelle to those which the people of the United States would be called upon to meet should the advocates of Government telegraphy succeed in foisting upon us a similar system. As the extent of our territory and the scattered population is to the densely-populated and compact territory of Great Britain, so would be the increased percentage of loss, while, from the peculiar character of our political system, a bottomless abyss of expenditure, official incompetence and corruption would be opened.

### NEW YORK STATE ASSOCIATED PRESS.

In the last issue of the JOURNAL we published a letter from the Secretary of the Northwestern Associated Press, expressing the satisfaction of that Association with the service of the Western Union Co.

We have now the pleasure of inserting a letter from SECRETARY TUCKER to PRESIDENT ORTON, transmitting a resolution adopted by the New York State Associated Press, at its recent annual meeting held in this city, by which it will be seen that the Western Union service is as popular in the East as in the West.

NEW YORK, May 20th, 1875.

Hon. WILLIAM ORTON,  
President Western Union Telegraph Co.

DEAR SIR: At a meeting of the Associated Press of the State of N. Y., held this day, the following resolution was passed:

"Resolved, That the thanks of this Association are due, and are hereby expressed to the Western Union Telegraph Company, for the promptness with which they have transmitted our reports, and their uniform courtesies in all the relations between us."

Respectfully,  
HENRY O'R. TUCKER,  
Secretary.

### STRIKE OF THE BOSTON MESSENGERS.

The messengers employed at the Central Office of the Western Union Company, at Boston, indulged in a strike on May 13th, and, as the result, they all lost situations in which the weekly earnings averaged \$6.50 per boy. The trouble arose from the fact that when off duty, messengers were required to leave their uniforms at the office, and, also, that they were required to wear a Summer uniform during the hot months. As the Company furnished this apparel at about half of the actual cost, the real cause of the strike can be ciphered down to the repugnance felt by these sturdy champions of independence in having a good suit of clothes presented to them yearly.

### THE ROYAL SOCIETY SOIREE.

The recent annual soiree of the President of the Royal Society was very brilliant and successful. The Royal Society's apartments consist of five noble rooms on the upper floor and two on the ground, and in each a sufficiency of novelties were displayed. In the first were some models, interest in which was at once excited by their simple labels. One of them was a model of Valour's pile-driving machine, used in the construction of the old Westminster Bridge, which was built in 1739 and following years; the other was the original machine constructed by Heathcote in 1808, which had the effect of reducing the price of bobbin net lace from five guineas a yard to five pence, *apropos* of which a quotation from Lord Bacon was given on the card: "For upon every invention of value we erect a statue to the inventor, and give him a liberal and honorable reward." In this room two of the prettiest and most instructive experiments were shown by Professor Barrett, namely, the lengthening of a bar of soft iron within a helix of wire by heat; the other the remarkable and anomalous changes which take place in the heating and cooling of iron wire. Thus, while the iron is first heating, there is a sudden contraction or cooling; and so again, when the heat is cut off, the

wire cools a little, and then suddenly reheats and glows, afterwards quietly passing down to a blackness. Now, the notable points of these jerks or changes are that the iron, in the first instance, loses its magnetism, and in the last jerk or oscillation regains it. In the second room some simple delicate radiometers were shown by Mr. Crookes. These consisted of a glass stem supporting a little four-bladed windmill, carrying four disks, one on each end of the four slender glass rays. These work horizontally, supported by a steel point on a small topaz, and the radiation of light from a common candle at some distance away suffices to make them rotate with great liveliness, in vacuo in a small glass globe. In the fourth room was a working model of Sir David Salomon's system of automatic railway signaling. Each engine is supposed to carry a battery and electric bell, and beneath it two metal wheels, insulated from each other, and pressing down on a signal line of small rails laid on the center of the sleepers. These central signal lines are double, and are laid in block lengths, one being a front signal line, the other a back signal line. On arriving at the termination of one block and the commencement of the next, one wheel will roll on the front signal line, while the other will roll on the back signal line, but at other places the left hand wheel will be free. Now one wire of the battery and one from the bell are taken to earth by being simply attached to the engine, the current passing through the ordinary rails of the permanent way. If, then, while a train was on one of the blocks, another train came on the same block, the bell on the engine of the following train would ring—a sufficient warning to stop and avoid danger. In the principal library, on the table beside the model of the fine telegraph ship *Faraday*, Mr. Siemens exhibited some large fragments of rock which had been dredged up in 1,400 fathoms, from the ocean depths, in the laying of the United States cable. Sir William Thompson's tide-calculating machines, in the same apartment, however, bore the palm of the exhibition. By means of the first one, observation of the rise and fall of the tide is made daily from the shore, and the facts so accumulated are the constants, and form the basis for setting the second or calculating machine, in which a continuous wire passes over a series of wheels placed at various distances, the result being that of harmonic motion of different periods and epochs, by which the year's facts can be ground out by turning a hand wheel, and recorded on the paper-carrying drum.

#### A NEW LIQUID RHEOTOME.

M. Ducretet calls attention to a "liquid rheotome of constant direction," based on a new property of aluminum. Suppose two electrodes, one of aluminum A, the other of platinum P, in a voltmeter connected with a battery. If P receive the positive electricity and A the negative, the water is decomposed, and the current passes freely through the liquid space between the electrodes; but if the current be reversed, the water is not decomposed, and the current passes very weakly. In the former case, an electric bell placed in the circuit will sound, or a piece of platinum wire will melt; but not in the latter case. Now, M. Ducretet proposes to utilize this property, if electrified positively, where it is required to send a current only in one direction. Coupling two liquid rheotomes by the plates of contrary name, different effects may be produced in the same electric apparatus (such as a printing telegraph), and in this case, with only one line wire. It may be variously applied in telegraphy.—*English Mechanic*.

#### ELECTRIC TELEGRAPHY IN AUSTRALIA.

A very interesting lecture or *conversazione* was given last evening in the Athenæum Hall by the members of the Victorian Electrical Society. There was a very large attendance, and the chair was occupied by Mr. Turner, Deputy Postmaster-General, who made a few introductory remarks. The Society had provided plenty of instruments for experiments, and to Mr. Daniels was entrusted the task of explaining the whole of the proceedings, which he did in a very lucid manner. During the evening, the systems of Morse and Wheatstone were fully explained, and in order to elucidate the manner in which telegraphic messages were transmitted from one station to another, a station was arranged on the platform and another in the gallery, with an intermediate station half way down the hall. At the former, Messrs. M'Gauran and Smibert officiated; in the gallery, Messrs. Clay and Jenvey were stationed, while Mr. Cumming was the operator at the intermediate station. The first part of the evening's entertainment was devoted to the explanation, in as simple a manner as possible, of the various systems of working the electric telegraph, and this was very lucidly done by Mr. Daniels, as was also the system of the construction of the circuit, so that the messages might be transmitted on the various lines. He explained that under the present system it was a matter of impossibility to send a message from both ends of the lines at the same time, and when two messages crossed on the way, it became necessary for the operators to break the circuit and allow one message to pass along the line before the other message was transmitted. The rate of speed attainable in sending messages by the Morse system was about the same as that attainable by a fast writer; but he thought there were not many writers with the pen who could keep up with some of the more expert operators. Twenty-five words per minute was the presumed competent operator's limit, but as much beyond that as he could do was his ambition, and as much as eighty words per minute, under certain conditions, had been attained. At the last Melbourne Cup meeting one operator sent two hundred and twenty messages in two hours—a feat only surpassed by the skill of the operator who received them. This part of the proceedings was illustrated by the transmission and reception of messages from different parts of the hall. Mr. Daniels then proceeded to give a scientific explanation of the system of duplex telegraphy, or the sending of two messages in opposite directions at the same time by the same wire. He stated that the system was not at all new, as it was discovered in 1853, but had not hitherto come into general operation. After making the explanation, Mr. Daniels had to admit that the explanation was difficult to understand without fully understanding the full working of the whole of the telegraph system. That the duplex system could be successfully worked was shown by the fact that several messages were sent from the platform and the gallery, and *vice versa*. The messages crossed one another most successfully, and were received simultaneously at each end of the hall. One of the questions asked, was whether messages could be transmitted without any wire, and Mr. Daniels answered this in the affirmative by stating that it could be done at short distances, and by means of a new American invention called a "snapper sounder," which can be carried in the waistcoat pocket, transmitted a message from the platform to the gallery. The remainder of the entertainment consisted of a number of interesting experiments with the electrical machine, including the explosion of torpedoes by electricity, all of which were attentively watched by the audience and loudly

applauded. It had been intended to give an explanation of the drum mystery, as shown by Heller and Hasalmayer at their entertainments, but owing to some defect in the battery the circuit could not be obtained, and as the instrument would not work, Mr. Daniels apologized to the audience for the excision from the programme. A vote of thanks to the chairman terminated the proceedings.—*The (Melbourne, Australia) Argus*, February 2d.

#### TOUGHENED GLASS.

Our Paris correspondent writes under date May 9: "You gave an account a few weeks ago of the discovery by M. François de la Bastie, a French engineer, of a process by which glass, while retaining its transparency, practically ceases to be brittle. Yesterday evening M. Victor de Luynes, who, with M. de Bastie's sanction, has for some weeks been making experiments at a glass manufactory, delivered a lecture on the subject at the annual meeting of the Société de Secours des Amis des Sciences. M. Dumas, the distinguished chemist and permanent Secretary of the Académie des Sciences, presided, and the large amphitheatre of the Faculty of Arts at the Sorbonne was crowded, most of the members of scientific bodies and the chief glass manufacturers being among the audience. M. de la Bastie himself was also present. M. de Luynes explained the expansion and compression of the exterior and interior parts caused by immersing glass heated to a certain temperature in an oleaginous bath, and he gave some highly interesting proofs of the success of the process. Thus he applied some vigorous blows with a hammer to a piece of glass which in its ordinary condition must have been broken into fragments, but which sustained this violence without being any the worse for it. A small tube of thin twisted glass being fastened in a vise, he endeavored to break off the extremity with a pair of pincers, but it was only after several attempts and by dint of much evident muscular exertion that he succeeded in doing so. A furnace, moreover, was brought into the hall, and a number of small globes and pieces of sheet glass were submitted to the toughening process. M. de Luynes then threw some of them on the floor to show that they could bear the shock. The globes were fastened by strings to staves of wood, at various heights, and an assistant mounting a ladder and setting fire to the string, they fell on the table with considerable force, thence rebounding on the floor, but only one or two of them were fractured, and those only when falling four or five yards. The assistant also mounted on a curved plate of glass placed on the table so as to represent an arc of a circle, but though the portion of the glass on which he stood was an inch or two above the table it bore the whole weight of his body. A similar experiment with much thinner glass was not so successful, but M. de Luynes stated that it had previously borne the strain, though it had been necessary for the assistant to mount upon it somewhat carefully so as to equalize the pressure as much as possible. Of course M. de la Bastie, as M. de Luynes explained, does not pretend that glass thus tempered is absolutely free from danger of breakage, but he claims that it will bear 80 or 100 times the strain of ordinary glass; and last night's experiments afforded conclusive evidence of the value of the discovery. The glass, moreover, it is stated, can be cut under certain conditions as easily as common glass. By means of the electric light M. de Luynes gave some interesting experiments of the optical properties of glass, the distribution of the colors, which were very brilliant, depending



on the shape given to the object. The audience showed the utmost interest in the experiments and explanations, the former evoking frequent applause. The greater durability of glass articles will obviously be a disadvantage to the trade, but against this must be set the use of glass for many purposes from which its brittleness has hitherto excluded it. Not only will it be applied to many domestic purposes, but in some branches of manufacture it is likely materially to cheapen production. In chymical works, for example, metallic chambers, which are expensive without being durable, will certainly be substituted by glass. M. de la Bastie is taking measures for the practical working of his discovery, and his English agents, Messrs. Abel Rey, Brothers of 29 Mincing-lane, exhibit a number of articles to which it has been already applied.—*London Times*.

#### RECENT ADVANCES IN SCIENCE.

Wheatstone, by a revolving mirror, determined the velocity of electricity, the duration of electrical discharges, and the duality in the direction of the transmitted disturbance. Feddersen, and more recently Rood, repeated his experiments. Indirectly the velocity of electricity thus ascertained (and the greatest known except that of gravitation) has been tested by signals through long lines of land and ocean telegraph, giving a lower figure than that of Wheatstone. But the anomaly is due to a misinterpretation. That electricity moves through a quarter of a mile of wire at the rate of 288,000 in a second is not evidence that it would move over 288,000 miles in one second. Electricity has no velocity in the ordinary sense. The transmission of the electrical disturbance is proportional to the square of the distance to be traveled; therefore the velocity varies with the length of the journey.

Had the results of Ohm been sooner heeded, science would have long ago been materially advanced. Arago, making use of Wheatstone's method, proved experimentally that the velocity of light was greater in air than in water, giving a fatal blow to the corpuscular theory of light, and establishing the undulatory theory. The mean of the two values obtained for the velocity of light in the experiments of Fizeau and Foucault comes very close to the astronomical estimate. Cornu has repeated Fizeau's experiment, eliminated its errors, and brought it into accord with Foucault.

ON MAGNETISM.—*Th. du Moncel*.—The property of magnetism of not readily penetrating into the whole of a magnetic mass explains easily the law of the proportionality of the attractive forces of electromagnets to the diameters of their nuclei. This law is in relation with their surface rather than with their mass, and explains the great power which the author has developed in a tubular electro-magnet with a nucleus 10 centimetres in diameter, a tube 1 centimetre in thickness, and with arms 30 centimetres in length. This electro-magnet, with a single Bunsen element, and with only 482 folds of wire of 4 m.m. diameter, exerted an attractive force of 160 kilos. The force was slightly increased with 5 Bunsen elements, but it was not further perceptibly increased even with 20, because the magnetic mass was no longer in relation with the electric energy.

THE experiments lately conducted under the auspices of the Russian Government with reference to the use of electricity for the head light of locomotives have shown that a battery of 48 cells makes everything distinct on the track a distance of a quarter of a mile.

#### FOREIGN ITEMS.

ON Wednesday, April 28th, the suit between the Panama and South Pacific Telegraph Company and the India Rubber, Gutta Percha and Telegraph Works Company, came before the Lords Justices on an appeal from a decision of Vice-Chancellor Malins. Its principal objects were to set aside an agreement entered into in January, 1870, between the two companies, whereby the latter agreed to make and lay for the former a submarine cable from Panama to Zanzibar, in Peru, and to obtain the repayment to the plaintiffs of two sums of £40,000 and £800 paid by them to the defendant Company, and to Sir C. Bright respectively, with interest. The Vice-Chancellor granted the relief asked for, and his judgment has now been confirmed on appeal.

At a special general meeting of the shareholders of the Panama and South Pacific Telegraph Co., held recently in London, the Chairman said the meeting had been called, as they were aware, to confirm the special resolutions passed at the special general meeting of the Company held on the 8th of April. He would, therefore, now move that the resolution—namely, "That the Company be wound up voluntarily—be now confirmed." This resolution was seconded and carried *nem. con.* The Chairman moved that Mr. James A. Brand be appointed the liquidator. The motion was seconded and carried unanimously.

THE report of the trustees of the Submarine Cable's Trust, presented recently to the fourth ordinary annual meeting of the certificate holders, stated that the revenue for the past year has amounted to £28,310, and the expenses (limited by the trust deed to £2,000) have been £1,695, leaving a balance of £26,615. Of this sum £21,213 has been applied to the payment of the coupons due on the 15th October, 1874, and 15th April, 1875; £3,179 was expended in the purchase of twenty-nine certificates in October last, and the balance has been carried forward. No change has been made in the securities held by the trustees since the last report was issued.

A STRONG demand for the shares of the Telegraph Construction & Maintenance Co. in London is reported. It is understood that this Company has recently made or will shortly conclude some very profitable contracts. At the dinner given to the Governor of Victoria, Sir James Ferguson announced, amid loud cheering, "That Mr. Vogel had successfully negotiated the formation of the last remaining link of telegraphic communication between England and New Zealand, and had secured important modifications in the tariff." It is understood that it is the contract for this cable which has caused the recent advance in the price of the shares of this Company.

THE number of messages transmitted from postal telegraph stations in the United Kingdom for the week ended April 24, 1875, was 391,403—an increase of 17,347 on the corresponding week last year.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom for the week ended May 1, 1875, was 394,518—an increase on the corresponding week last year of 16,669.

THE average time occupied in the transmission of telegrams between Madrid and England, "via Santander," during April, was two hours and fifty-seven minutes, including transmission over Spanish land lines.

THE receipts of the Brazilian Telegraph Company for the month of April, 1875, were £11,945.

THE number of messages by the Cuba Submarine Telegraph Company's lines during the month of April was 2,235, estimated to produce £2,200, against 1,518 messages, producing £1,525, in the corresponding month of last year. The cable was cut from the 7th to the 13th to establish communication with the new station which has now been open at Cienfuegos.

THE traffic receipts of the Eastern Telegraph Company for the month of April, 1875, amounted to £31,252, and for the corresponding period of 1874 to £30,766.

THE receipts of the Eastern Extension, Australasia and China Telegraph Company, for the month of April, amounted to £18,413, and for the corresponding period of 1874 to £16,670.

THE traffic receipts of the Great Northern Telegraph Company for the month of April amounted this year to 851,662fr., and last year to 348,153fr. Total traffic receipts from 1st of January to 30th of April, this year, 1,235,974fr. (£49,439); and last year, 1,826,066fr. (£53,043).

THE receipts of the Submarine Telegraph Company for the month of April, 1875, amount to £9,298. The receipts for the corresponding month of the preceding year amounted to £8,510.

THE receipts of the Western and Brazilian Telegraph Company for the five weeks ending the 30th of April was £12,552.

Messrs. MORTON, ROSE & Co., of London, announce that the definitive bonds of the Western Union Telegraph Company of the United States, of the issue of £1,030,000 six per cent. loan, are now ready for delivery in exchange for the fully paid Scrip Certificates.

TELEGRAPHIC communication in Japan is to be extended to the Loochoo Islands.

THE Government of Western Australia has commenced a line of telegraph which will establish instant communication between that colony and Adelaide, South Australia.

A MILITARY telegraphic service is about to be organized in France.

It is rumored that the new cable to connect New Zealand with the Eastern Extension, Australasia & China Company's telegraph system, will be laid during the present year.

#### BORN.

BREWER.—At Binghamton, N. Y., May 23, 1875, to H. Y. Bresee, operator W. U. Telegraph office, twins, boy and girl.

JOHNSON.—At Hope, Ark., April 5, 1875, to H. E. Johnson, Manager W. U. Telegraph office, a son.

RIDDLE.—On April 27, 1875, to S. D. Riddle, Manager branch office at Clafin's, New York City, a daughter.

#### MARRIED.

HOLMES—MANDEVILLE.—At Woodside, N. J., April 29, 1875, Wm. Holmes, of New York, to Miss Emma Mandeville, of Woodside.

NIMS—WOOD.—At the residence of the bride's parents, Thursday evening, April 15, 1875, by Rev. H. A. Philbrook, Francis E. Nims, Manager Western Union Telegraph office, Nashua, N. H., to Miss Clara A. Wood, of Nashua.

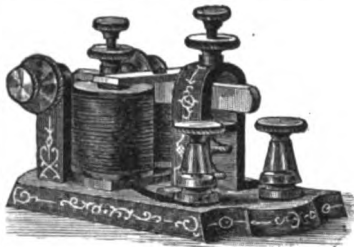
WARD—WALKER.—At Connellsville, Pa., on the evening of May 18, 1875, by Rev. J. M. Barnett, Ed. J. Ward, Manager W. U. Tel. office, to Miss Minnie B. Walker, daughter of ex-Sheriff D. L. Walker.

#### DIED.

BREWSTER.—At Tecumseh, Ala., May 19, 1875, John W. Brewster, formerly an operator of the W. U. Tel. Co.

RYAN.—At Thomaston, Conn., Saturday, April 10, 1875, of pneumonia, Nellie J., daughter of Michael Ryan, Manager W. U. Tel. office, aged 3 years, 4 months and 13 days.

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Polished Rubber Covers, 50c. Extra.



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One Cell Gravity, or Callaud Battery, Connection Wire, Book of Instruction, 1 lb. Blue Vitriol, &c., all for..... 1.65  
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FROM ANTWERP.

For Philadelphia. For New York.

NEDELAND, VADERLAND,	May 21, June 14.	State of Nevada, SWITZERLAND,	June 2, June 26.
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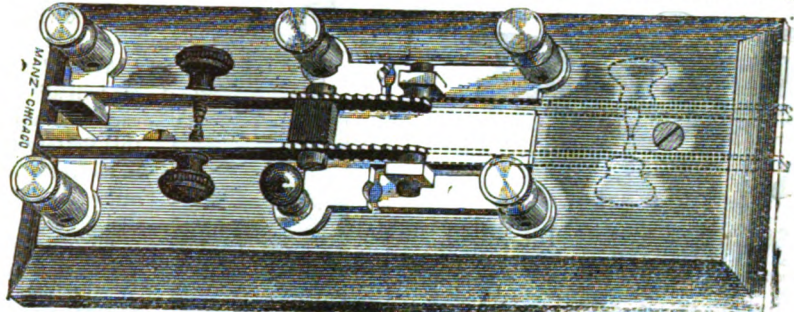
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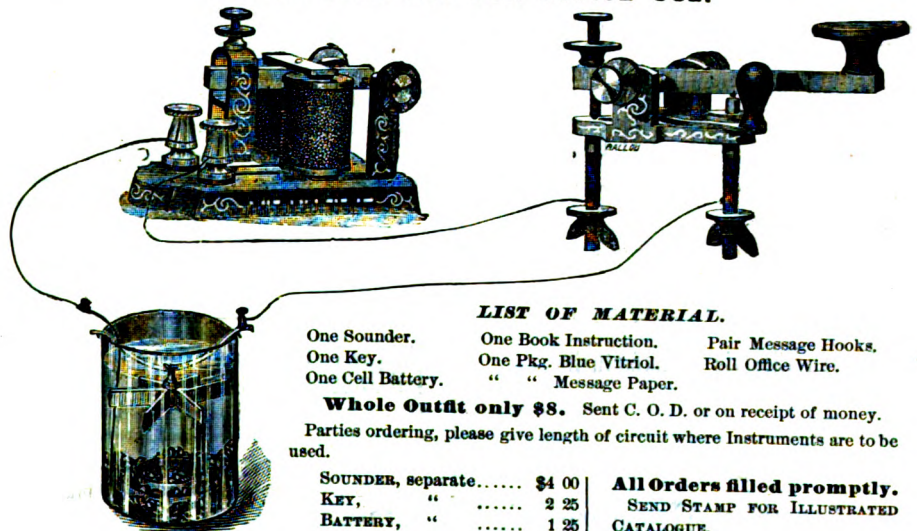
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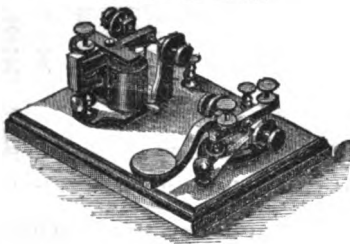
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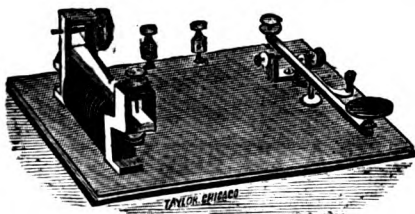
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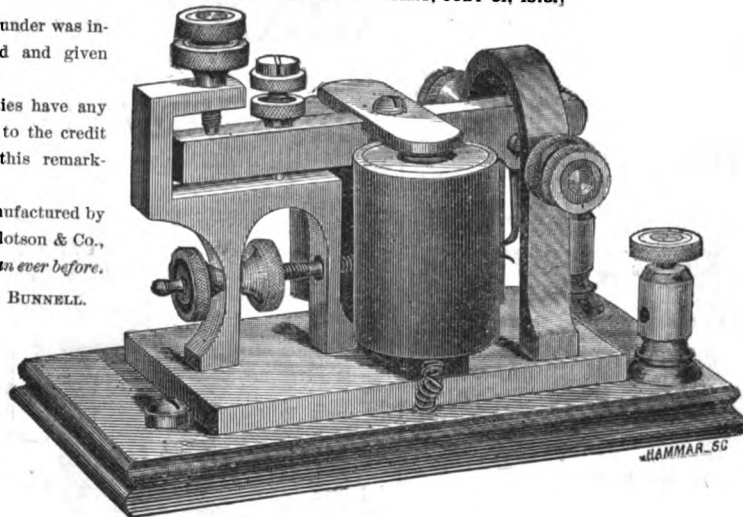
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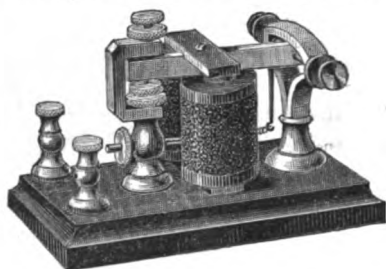
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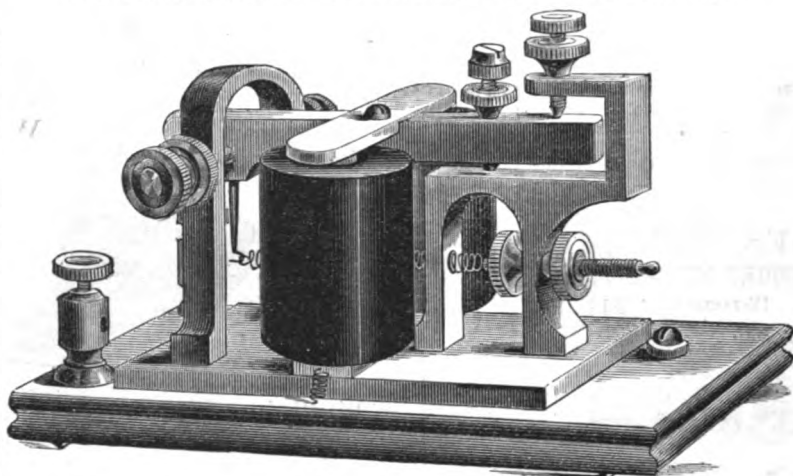
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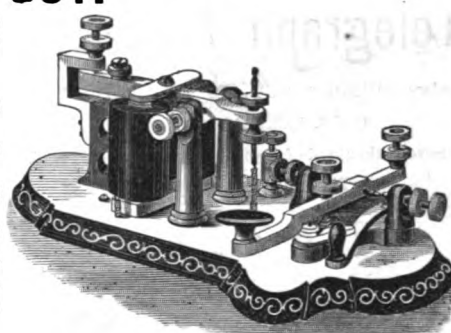
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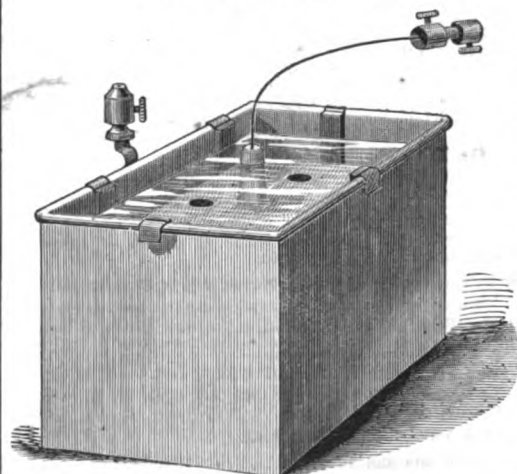
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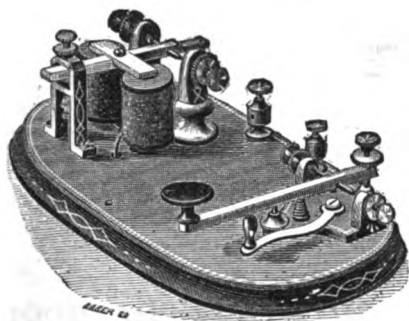


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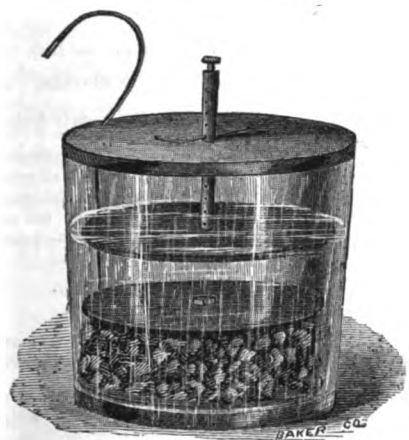
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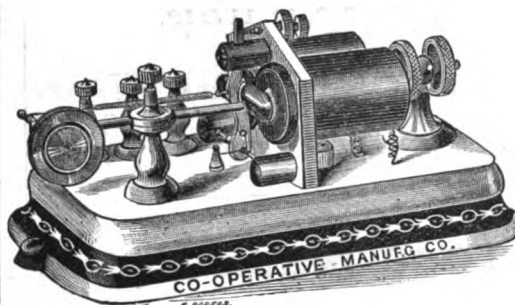
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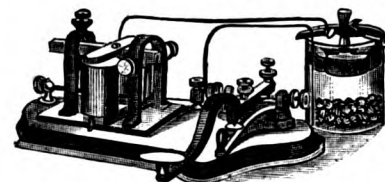
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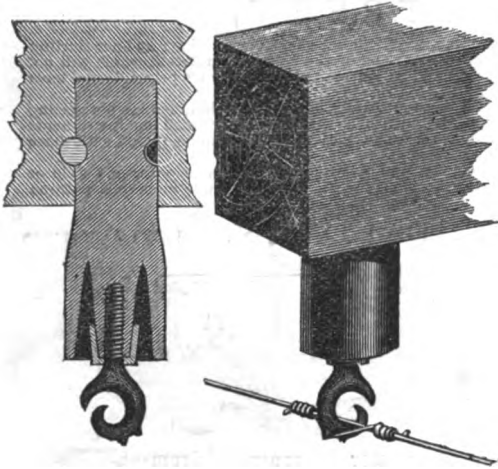
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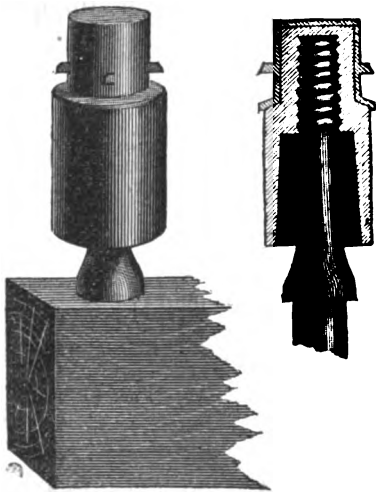
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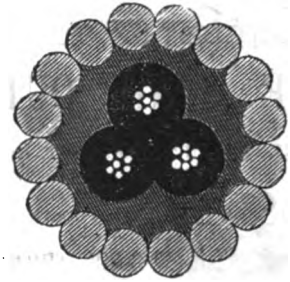
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 12.

NEW YORK, JUNE 15, 1875.

WHOLE NO. 183.

## ELECTRO-MAGNETISM AND ELECTRO-MAGNETIC INDUCTION.

### THE MAGNETIZATION OF IRON BY MEANS OF THE GALVANIC CURRENT.

The galvanic current exercises its influence not only upon a magnet, which may by this means be made to deviate from its state of rest, but also upon unmagnetized iron, which, under appropriate conditions, may be converted into a powerful magnet. For this purpose we usually give to the soft iron the form of a horseshoe, which is surrounded by helical coils of properly insulated copper wire wound upon it, care being taken that the coils retain the same direction as if the horseshoe were stretched out straight. When we connect the extreme ends of the wire with the poles of a galvanic battery, we find that the iron instantly becomes magnetic, and continues in this condition as long as the current lasts. One end of the horseshoe becomes a magnetic north pole, the other a south pole. Such an arrangement is termed an electro-magnet. The kind of polarity depends upon the direction of the turns of the helix and upon the direction of the current in the wire.

### THE AUTOMATIC CIRCUIT-BREAKER.

When we employ very soft iron for the electro-magnet, it receives its magnetism instantaneously when the circuit is closed, and as suddenly loses it when the circuit is broken. Advantage has been taken of this quality of the electro-magnet, both in physics and in telegraphy, to produce exceedingly rapid mechanical motions, and apparatuses have been constructed which, under the influence of a galvanic current, will continue for several days in the most rapid motion by their own automatic action.

The principle upon which all these instruments are based is that of the automatic circuit-breaker, and will be easily understood by reference to Fig. 1.

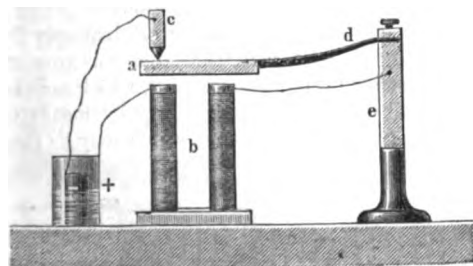


Fig. 1.

Over the poles of an electro-magnet *b* the armature *a* is suspended by a steel spring *d*. This spring presses the armature (when it is not attracted) against an adjustable contact-screw *c*, which is connected with one of the poles of a galvanic element; the other pole of this element is connected with the coils of the electro-magnet, which are in turn connected with the metallic post *e* supporting the steel spring *d*. As soon as the circuit is closed the current flows through *+ b, c, d, a, e* — passing around the electro-magnet. The armature *a* is at once attracted,

but owing to this the contact between *a* and *c* is broken. The electro-magnet *b* then again loses its magnetism, the spring *d* throws the armature *a* up towards *c*, the circuit is restored and the movement is repeated. In this way an uninterrupted series of breaks and closes of the current takes place, and a continuous up-and-down movement takes place with such rapidity that we are scarcely able to follow it with the eye.

The principle on which this operation is based may be expressed as follows: The current induces magnetism in an electro-magnet, hence in succession follow attraction of the armature, breaking of the circuit, falling off of the armature, closing of the circuit and re-establishment of the current, and so on indefinitely.

### THE MOST IMPORTANT PHENOMENA AND LAWS OF GALVANIC INDUCTION.

It was known at a very early period that a magnet is capable of magnetizing a piece of iron

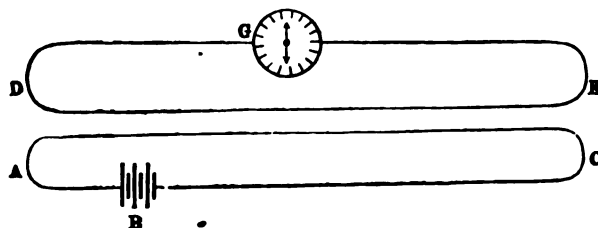


Fig. 2.

which is brought near to, but not in contact with it; and it was also known that the electricity developed from the electrical machine electrifies any body in the neighborhood of the conductor by action from a distance. To these phenomena Faraday added, in 1830, the important discovery that a galvanic current is able to induce other galvanic currents in wires which are in its vicinity, without actual contact with them. The process of action by which these additional currents are produced by a current already present is called galvanic induction. The currents generated are called induced or secondary currents; the existing current originating in the battery is called the main, or, more frequently, the primary current.

The principal law of galvanic induction is the following: If another closed wire is placed in proximity to a wire, or generally, to a conductor, which is in connection with a galvanic battery, then, at the very moment that a current arises or ceases in the primary wire, a secondary current originates in the auxiliary wire, which, however, invariably lasts but a moment. This secondary current, produced by the primary current in the neighboring wire, is termed the induced current. To illustrate this phenomenon, let us suppose B, Fig. 2, to be a galvanic battery, and A C the wire which connects the poles of this battery; in the vicinity of, and parallel to which, is the wire D E, whose extreme ends are connected to a galvanometer G, capable of indicating the presence of a galvanic current. As the wire D E is not connected with the galvanic battery, no current circulates through it, and the magnetic needle of the

galvanometer G remains at rest. Now, as soon as the circuit of the battery B is closed, and a current traverses the wire A C, a current also originates in the second wire D E, whose presence is immediately indicated by the galvanometer G, and whose direction is opposite to that of the primary current. If we suppose the current in the main wire to flow from A toward C, then the induced current in the auxiliary wire will flow from E toward D.

The induced current is almost instantaneous; it only lasts for a moment and then disappears, although the primary current of the battery B continues to flow in the wire A C. The moment the circuit of the battery B is closed, the needle of instrument G is suddenly deflected, and by its movement indicates the formation of the induced current, but it returns immediately to a state of rest, and remains thus during the continuance of the current in the wire A C.

As soon, however, as the circuit of the battery B is opened, an induced current appears in the secondary wire D E simultaneously with the disappearance of the main current. This is also only of momentary duration, and traverses the wire in the same direction as the disappearing main current. As we have seen, if the battery current circulates in the direction from A to C, then the induced current which originates in wire D E, when the circuit of the battery is opened, will be in the same direction as the main current, or from D to E, while the secondary current, which arises when the primary current is closed, is in the opposite direction, or from E to D.

It therefore follows from the above:

1. That induced currents are of exceedingly short duration.
2. That at each closing of the battery wire the induced current is opposite to the battery current, and at each opening of the battery wire the induced current is in the same direction as the battery current, from which it furthermore follows:

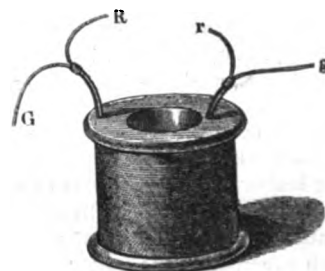


Fig. 3.

3. That when the battery circuit is successively closed and opened, two induced currents are generated which are in opposite directions. If we were to close the battery wire 600 times per minute and open it the same number of times, we would produce in a neighboring wire 1,200 induced currents, which would alternately flow in opposite directions. If we indicate these successive currents as they originate by the consecutive numbers 1, 2, 3

etc., then the series of currents indicated by the odd numbers, as well as the series indicated by the even numbers, have the same direction, while the direction of the even currents is opposite to that of the uneven currents.

The intensity of the induced current is proportional to the strength of the primary current, or the strength of the battery; moreover, it depends upon the distance of the secondary from the primary wire, and upon the length of wire subjected to the inductive action. Now, as the aggregate inductive action of the main wire A C consists of the total of lesser actions, such as the single element of A C exercises upon the neighboring portions of the wire D E; so the induced current in D E increases in proportion to the number of such portions of A C which act inductively on the secondary wire. Hence, in general, the effect increases with the length of both wires.

The latter consideration serves as a guide in constructing apparatus by means of which powerful induction currents are to be produced. These consist, as shown in Fig. 3, of two distinct wires brought close together, which must not, however, be allowed to come into conducting contact. For this purpose the wires are very carefully over-

culating in the coil A. When, however, the circuit is closed at *g*, then the movement of the needle at M indicates that the coil is being traversed by a current which is in an opposite direction to the current of the coil B. When the battery circuit is opened the needle again moves to nearly an equal distance in the opposite direction.

As long as a current traverses the wire B the needle of the galvanometer remains at rest, although any sudden increase of it will induce a current of opposite direction in the secondary wire A; on the contrary, any sudden decrease of the current strength in the main wire causes an induced current in the secondary wire in the same direction.

If the main or primary wire be brought nearer to or removed further from the secondary wire, the same effect is produced. That is to say, if the thick wire of the coil B, while traversed by a current, is brought suddenly nearer to the thin wire of the coil A; or, what amounts to the same thing, if the coil B, while traversed by a current, is suddenly inserted into the coil A, an induced current originates in the coil B which is *opposite* to the main current. By the rapid withdrawing of one coil from the other another induced current is generated, which is in the *same* direction as the battery current. Both these

screw *b*, supported by the brass pillar *a*. This screw may be adjusted forward or backward, so as to make the plate *c* approach the iron core, more or less, according to the strength of the current. One end of the thick wire is attached to the spring *e*, and is wound around coil R, and serves to conduct the current of the battery B around the coil; the other end of the wire *f* proceeds to one of the poles of battery B, while its other pole is connected to the screw post *a*.

As soon as the battery B is connected as represented in the figure, the current proceeds from the + pole towards *a*, through the screw *b* to the plate *c* and spring *e* to the thick wire of coil R, and thence through the coil, and finally out through the wire *f* to the — pole of the battery.

The current which circulates around coil R causes the inner core of soft iron to become magnetic; the pole *d*, therefore, attracts the small iron plate *c*, and separates it from the screw *b*. The current which is passing over *b* to *c* is thus interrupted; the magnetism disappears from the iron core *d*, the light armature *c* is no longer attracted, and owing to the elasticity of its support *e*, springs back against the contact-screw. When the contact is reestablished, the current flows again; the core *d* be-

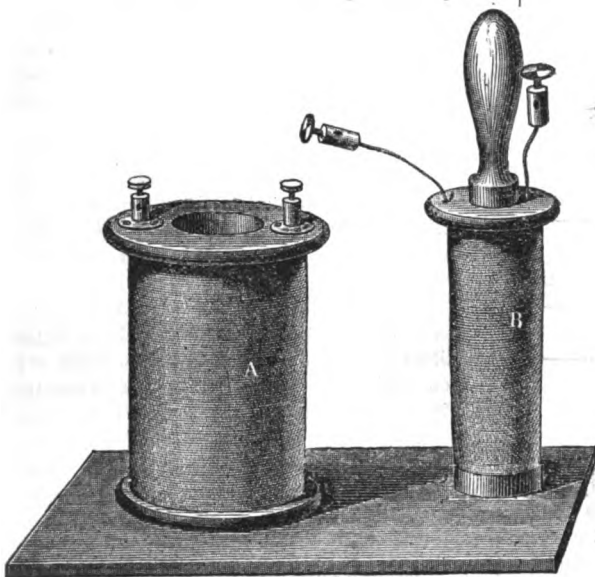


Fig. 4.

spun with silk, which insulates them from each other. They are then wound for a great length in the same direction close together on a wooden or pasteboard bobbin. The primary wire (for instance R *r*, through which the battery current is conducted) is much thicker than the secondary wire forming the induction coil. The fine wire G *g* is the secondary, and the heavier the primary or main wire.

In some instances, as shown in Fig. 4, each of the two wires is wound, well insulated, upon a peculiar wooden bobbin, cylindrically grooved, and so arranged that the coil B of the main wire may be placed inside of the hollow coil A, consisting of thin wire. In all cases the ends of the thick wire are connected with the battery, while the ends of the thin wire either to each other, or to the parts through which the induced current is to be conducted.

Fig. 5 shows the construction of these parts. A is the induction coil, consisting of a long, fine wire; B is the primary or inducing coil of thick wire, E the battery, and M the galvanometer. The extreme ends *a b* of the coil A are connected with the galvanometer, and the ends *c d* of the thick wire, by means of a mercury cup *g*, with the poles *p n* of the battery. When in a state of rest the needle of the galvanometer indicates that there is no current cir-

culating in the coil A. When, however, the circuit is closed at *g*, then the movement of the needle at M indicates that the coil is being traversed by a current which is in an opposite direction to the current of the coil B. When the battery circuit is opened the needle again moves to nearly an equal distance in the opposite direction.

As we have seen, the number of the induced currents depends entirely upon the number of times the primary circuit is opened and closed, and it therefore becomes necessary, in the arrangement of induction apparatus, to provide means by which the battery current may be opened and closed with the utmost possible rapidity and certainty.

This operation, simple as it may seem, cannot be successfully performed by hand. Hence this function is transferred to the current itself, by the employment of an automatic circuit-breaker.

Fig. 6 represents such an arrangement with a spring break-piece. R is the induction coil, composed of thick and thin wire; it has an opening in its center, which is filled up by cylinder *d*, of soft iron, or with a bundle of wires of the same material, which, in connection with the coil of thick wire, forms an electro-magnet. The iron core *d* projects somewhat from the coil; opposite to it is placed a small iron plate or armature *c*, which is attached to a metallic spring *e*, which, when in state of rest, presses the armature against the metallic contact-

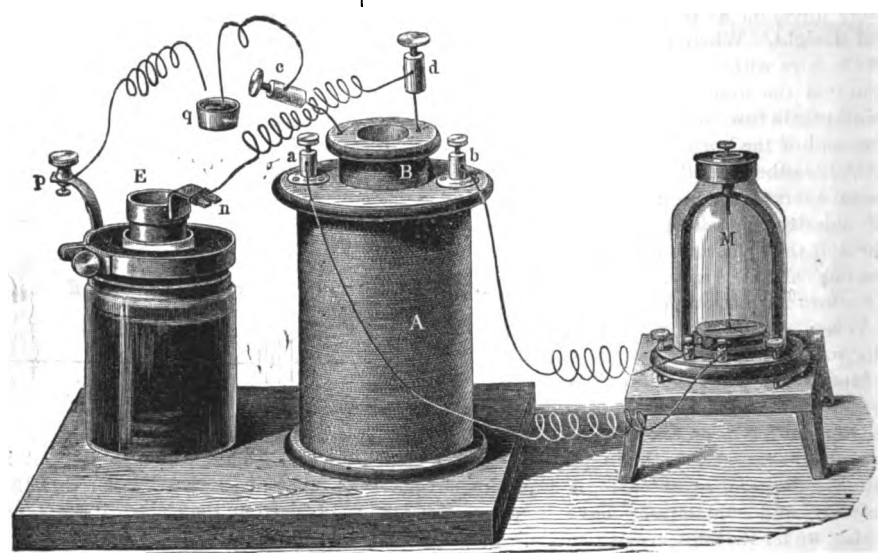


Fig. 5.

comes magnetic, and attracts *c*, and the current is again interrupted. In this way the play of the automatic circuit-breaker continues indefinitely, the current in the primary coil being alternately established and broken. Hence there originates in the neighboring thin wire, whose extreme ends are seen at *x y*, a series of induced currents, which may be conducted beyond the terminals *x y* by means of conductors connected by clamps which may be used at pleasure.

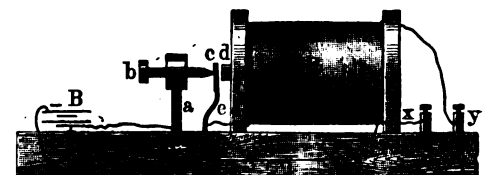


Fig. 6.

THE LAWS AND LEADING PHENOMENA OF MAGNETO-INDUCTION.

It has already been shown that when a primary wire traversed by a current is suddenly brought near to, or removed from the secondary wire, a momentary current is induced in the latter. Precisely the same result follows if, instead of the primary wire



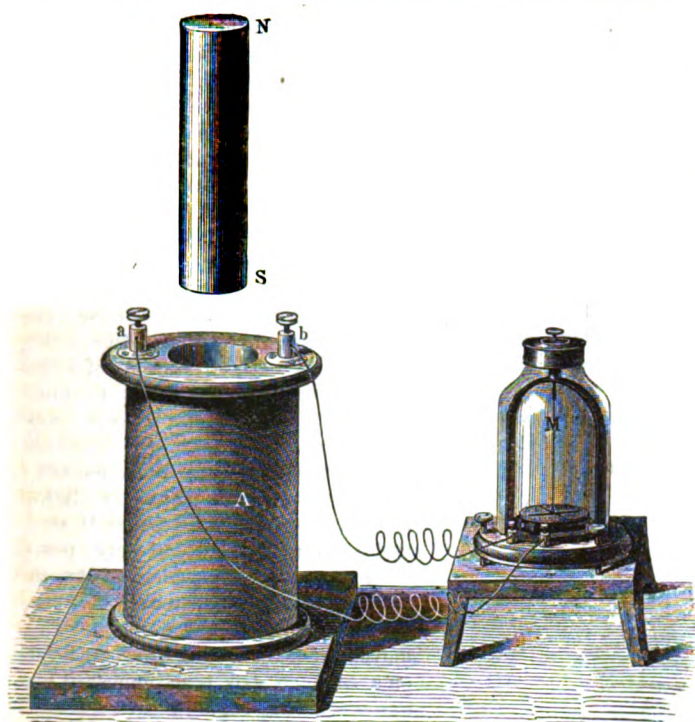


Fig. 7.

or coil traversed by a current, we employ a powerful magnet. For instance, if we suddenly place within the coil A (Fig. 7), composed of fine and well-insulated wire, a powerful magnetic bar N S, an induced current will be set up in the wire of the coil, provided its ends are conductively connected. As long as the magnet remains at rest, no induced current is manifested, but if it be suddenly removed, another induced current arises in the coil, the direction of which is opposite to that of the former one. The direction of both these currents, which are in all cases opposed to each other, depends upon the polarity of the end of the magnet which is turned towards the coil.

By causing a magnet and a coil of wire to alternately approach and withdraw from each other in rapid succession, momentary induced currents, flowing alternately in opposite directions, are produced in the wire. The importance of this phenomenon will be apparent, when we consider that it is by this means that very powerful galvanic currents may be obtained without the annoyance arising from galvanic batteries, by the mere movement of a powerful magnet in proximity to a wire coil. These galvanic currents are, it is true, only of a very short duration, are alternately opposed to each other in direction, but in other respects possess all the qualities of ordinary battery currents, and are frequently used for medical purposes, as well as to work electric telegraphs, clocks, bells, etc.

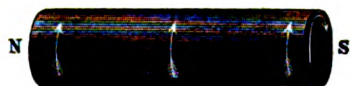


Fig. 8.

The direction of the current induced in a closed wire coil and acted upon by a magnet, depends upon the direction of the motion (whether approaching or withdrawing); upon the direction of the turns of wire whether the spirals are wound to the right or left; and upon the polarity of the end of the magnetic bar which is nearest when the wire coil is set in motion. In order to be able to know beforehand, the direction of the induced current which will be produced by the motion of a magnet, we may, with Ampère, look upon the magnet as a system of galvanic currents which surround the iron core perpendicularly to its length. The direction of these ideal currents is found by means of the rule previously given.

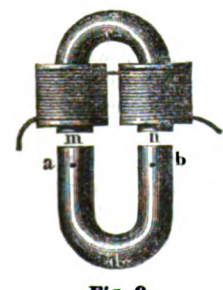


Fig. 9.

After this let us look at the south pole and imagine the magnetic bar as in Fig. 8, surrounded by currents in such a way that they pass around the south pole in the direction of

the hands of a clock. If in this way we suppose the magnet to be a system of galvanic currents, the same rule applies with regard to the direction of the induced currents produced by the movements of the magnet. This rule has been previously given in reference to the movement of a wire coil traversed by a current to and from an induction coil.

The induced current which is generated in the coil A when the south pole S (Fig. 7) is inserted into it, has a direction opposite to that of the hands of a clock, without reference to the direction of the turns of the coil. Therefore upon the front side of the coil A, which is turned towards the spectator, the induced current passes from right to left. When the south pole is withdrawn from the coil the induced current is in the opposite direction, or from left to right.

Instead of making use of a magnet and a wire coil in the manner above described, we may inclose a piece of soft iron, in the form of a horse-shoe, with a helix of wire *c* (Fig. 9), and induce a magnetism in it by bringing it rapidly into proximity with a steel magnet *a b*.

Thus, when we bring the soft iron *c* near a steel magnet, the iron itself becomes magnetic; and hence the movement of the iron core *m* and *n* towards the poles *a* and *b* gives rise to the same action as that which occurs when a magnet moves towards a wire coil.

By the removal of the soft iron *c* from the magnet *a b*, it again loses its magnetism, and thus the withdrawal of the iron cores *m n* from the poles *a b* gives rise to precisely

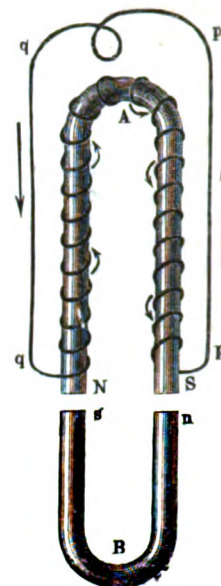


Fig. 10.

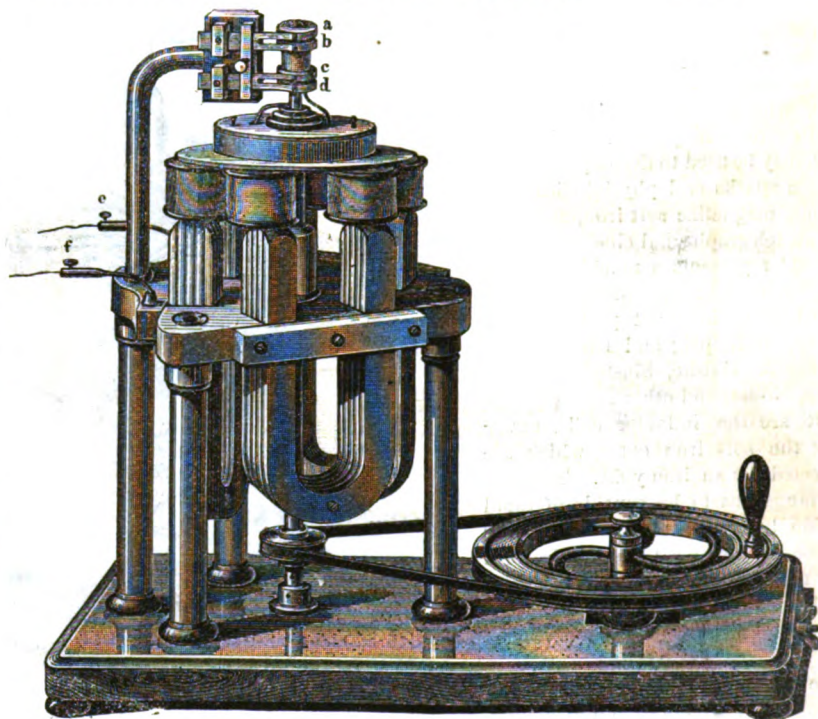


Fig. 11.

the same phenomena which occur when a magnet is removed from a wire coil.

Hence, if we give to the iron core *c* with its helices a rotary motion, so as to cause the extreme ends *m* and *n* to pass close to the poles *a* and *b* of the permanent steel magnet, then, when the end *n* moves away from the pole *b*, and *m* from *a*, the removal of coil *n* from south pole *b* causes an induced current in the same direction as the current which arises upon the removal of coil *m* from the north pole *a*.

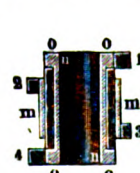


Fig. 12.



Fig. 13.

In order to clearly understand this, it may be well to bear in mind that the direction of the turns of the wire coil, as represented in Fig. 9, exactly correspond to those of the wire in the helix of an electro-magnet.



Fig. 10.

Fig. 10 represents an electro-magnet in which the turns are somewhat separated from each other. When a non-magnetic horse-shoe A is brought close to a permanent steel magnet B, there arises in the former a magnetic action. A north pole N is suddenly formed opposite to the south pole S, and a south pole S opposite the north pole N. The effect of this magnetic action upon the helix is the same as if the north pole of a magnet were inserted into it at N and a south pole at S; that is, a current is induced in each leg. The directions of these currents, as indicated by the arrows, are apparently opposite to each other in the different legs, but are really in the same direction, and mutually reinforce each other in the wire *p q*.

During each half revolution of the helices *c* (Fig. 9) two induced currents in the same direction are generated in the connecting wire, while the helices are approaching the poles of the permanent magnet *a b*, but during the next succeeding half revolution two other induced currents are generated, which, in consequence of the removal of the helices from the magnet poles, have an opposite direction with respect to the first pair of currents.

#### THE MAGNETO-INDUCTION MACHINE.

When we attach to the helices (Fig. 9) suitable arrangements by which it may be put in rapid rotation, we have what is termed a magneto-electric machine, which produces a series of induced currents in quick succession, and which may be used to decompose water, produce sparks and physiological phenomena, magnetize soft iron, and even to work telegraphs and clocks.

Fig. 11 represents a machine of this kind, such as are constructed at the present time in great perfection by Stöhrer, in Leipzig and Dresden; by Siemens & Halske, Sinsteden, Pixii, Clarke, Nollet, and others.

*R R'* are the inductor coils, enveloping the soft iron cores, which are connected by an iron yoke. They are so arranged as to be capable of rapid rotation, by means of a crank passing as close as possible to the poles of a steel magnet, and each core becomes thereby transformed alternately into a north and a south pole as it revolves.

Fig. 11.

The terminals *a b* serve to conduct the induced currents from the helices, either to the human body, or, if it is desired to produce mechanical effects, to other suitable apparatus. They are connected directly to the pole-changer, the office of which is to change the currents of opposite direction, which arise during each half revolution, into currents of the same direction, and thus cause the machine to furnish only currents of one and the same polarity. The construction of this device, which is sometimes called a *commutator*, may be easily comprehended by reference to the sectional view (Fig. 12), and the perspective view (Fig. 13). *m* is a brass cylinder, upon whose extreme ends two steel half rings, 2 and 3, are soldered in such a manner that they lie exactly opposite to each other, with the ends slightly projecting. Within this cylinder *m*, but separated from it by a thin insulating bushing of boxwood (in Fig. 12 the section of boxwood is represented in

black) is inserted another brass cylinder *n n*, which projects beyond the tube in both directions, and carries up on its projecting portions two other steel half rings 1 and 4, which correspond with the former pair 2 and 3, as very distinctly shown in Fig. 13. Hence while rings 2 and 3, and also rings 1 and 4 are in conducting connection with each other the first pair of rings is insulated from the second by the boxwood.

One end of the wire of coil *R* (Fig. 11) is in permanent connection with ring 1, and the end of coil *R'* with ring 2.

The entire apparatus, above described, turns round with the axis. *a* and *b* are two thin steel springs, each of which is attached at one of its ends to the machine, the other end being split so as to press with considerable elasticity against the rings 1, 2, 3 and 4 as they revolve.

The brass supports, to which the springs are at-

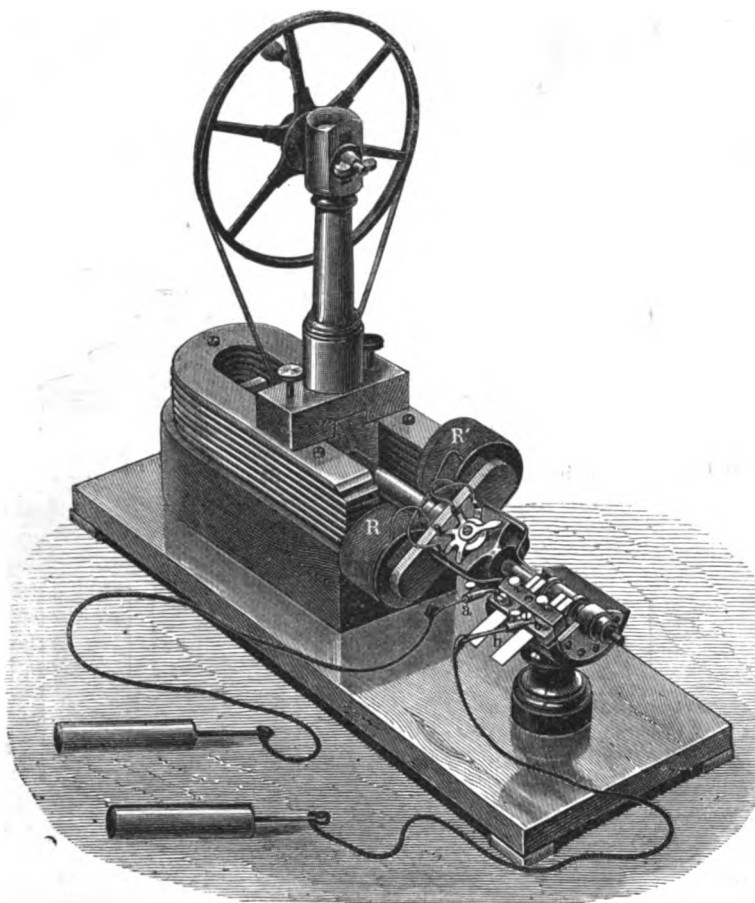


Fig. 14.

tached, are provided with binding-screws for the attachment of wires by which the current may be conducted to any required point. The device which is placed between the coils *R R'* and the commutator or pole-changer, serves for purpose of combining the several convolutions of the coils in various ways. In one position it unites the ends of both coils so that the turns form one continuous wire; in the other position it connects the front ends of both coils with each other, and the rear ends in like manner. In the former case the current passes through the entire length of the single wire, forming what is called an intensity-inductor; in the other case the length of the wire in circuit is reduced to one-half, and the cross-section is doubled, forming a quantity-inductor. Hence, in the first case, the resistance of the coils is four times as much as in the latter case.

Another construction likewise employed by Stöhrer in a magneto-electric machine of large size, is represented in Fig. 14. This consists of three upright magnets with six induction coils. The direction of the turns of each coil is necessarily so arranged that the induction-currents which arise when the coils are approaching the several magnetic poles are of the same direction. When the coils are moving away from the magnetic poles, we again obtain currents of the same direction, which are, however, in reverse direction to the preceding ones. Hence the machine, at each complete revolution of the vertical axis which carries the coils, generates twelve currents which are alternately in one direction and the other. Each of these 12 currents consists of 6 elementary currents, which are generated simultaneously in each coil, and always unite to form a single powerful current.

The larger magneto-electric machines as constructed for producing the electric light, are used for light-houses, vessels, etc., and contain from 50 to 60 very powerful systems of magnets, between whose poles the same number of powerful wire-coils are made to rotate. The movement of these coils, which are fixed on a common axis, is accomplished by means of a steam engine of several horse power.

#### THE ELECTRIC LIGHT.

Dr. Wilde of the Academy of Sciences of St. Petersburg, and Director of the Central Physical Observatory, has recently made a report to the Academy upon the new mode of producing the electric light proposed by M. Ladiguin of that city. Since the improved magneto-electric machines have reduced the cost of the electric light to only one-third that of coal gas, these efforts to utilize it have been redoubled. And, as a result, M. Ladiguin has made an invention which, in a very simple way, resolves both problems, rendering the light steady, and at the same time capable of division. It has long been known that the electric light proper comes from the intensely-heated carbons which the current traverses the resistance of the air between them developing this heat. So the resistance of a platinum wire placed in circuit causes it to be highly heated; but the light thus obtained, though constant and entirely controllable, is too feeble for practical use. Again, the resistance of the carbon employed is 250 times greater than that of platinum; hence it follows that a rod of carbon may be fifteen times as thick as a wire of platinum the same length, and yet be heated by the same current to the same degree. Finally, the carbon may be heated to the most intense whiteness without the danger of fusion, to which platinum is liable. These are some of the advantages of carbon; its only disadvantage is that heated in air it burns, and so gradually wastes. But M. Ladiguin has happily obviated this difficulty by enclosing the rod of carbon in a glass cylinder containing no oxygen and hermetically sealed. Dr. Wilde asks, in conclusion, that the Academy recognize the fact that M. Ladiguin has solved the grand problem of dividing and rendering steady the electric light, in the simplest possible manner, and that they award him, in consequence, the Lomonossow prize.

## CORRESPONDENCE.

VICTORIA, V. I., May 4th, 1875.

*To the Editor of the Journal of the Telegraph:*

Will you please give your opinion as my authority on the following points, on which I am in doubt:

1st. A person calls at the office and requests that all telegrams that may come for him be delivered in care of A. A telegram comes addressed in care of B. Who am I to deliver it to? Should I follow directions given in telegram, or instructions left by the party for whom the message is?

2d. Again. A person holds a frank which is limited, say between this place and Portland, Oregon; wants to send a message to San Francisco. He objects to my charging the regular rate, and insists that his frank covers the distance from here to Portland. Can such objection be sustained, and, if so, how will I check the message?

3d. A stranger sends a telegram requesting a transfer. When that transfer arrives, is it necessary for me to have some one to identify the stranger, or is it enough for me to know that I paid it to the man who telegraphed for it? If he has done this under an assumed name, would not the Company be held responsible for the money thus paid? A. L. M.

*Answer.*—1. You should follow the instructions of the party addressed, which should be given in writing.

2. Franks, which are limited, cover business only within the limits specified. Any message destined to a point outside of the limit should be charged the whole rate between the office of origin and the office of destination.

3. It is necessary that an unknown person, who requests a transfer, should be identified before being paid the money, even if it is known that he is the party who telegraphed for it. The rules governing the transfer service are very stringent and also very explicit upon this point.

MEMPHIS, Mo., June 7, 1875.

*To the Editor of the Journal of the Telegraph:*

Please say how many words there are in the following message:

MEMPHIS, Mo., 7th.

To GEO. W. PORTER & S. S. RAMSEY, Portland, Mich.:

Send power of attorney to sell territory to Memphis, Missouri, immediately.

R. C. RAYMOND.

Ck—Paid, via Lansing, Mich.

Repeating office claims there are 18; I claim there are but 14. Please answer through JOURNAL, and oblige H.

*Answer.*—There are eleven words in the body, but there are two messages.

*To the Editor of The Journal of the Telegraph:*

How is it in settling with the auditor an office never overchecks itself? If an account current is short ten cents Mr. Auditor corrects it. That is all right. But ought he not in fairness also look up the other side? He has paid clerks and might do it. Railroad companies do this; express companies do this; insurance companies do this; sewing machine companies do the same, and it is strange that the W. U. Tel. Co. should be an only exception. Please answer through the JOURNAL.

MASSILLON, OHIO.

*Answer.*—In a business where the debit and credit entries of messages amount in the aggregate to more than two million each month, it does not follow that because one office under-checks another that therefore the other office over-credits and is a loser thereby.

The presumption is that the error is that of the checking office, which has no direct pecuniary interest in the matter, rather than that of the crediting office which does have such interest.

It costs the Company many thousands of dollars annually to look after under-credits whereby it would lose, and to discover and give notice of under-checks (or over-credits, so-called) it would cost many thousands of dollars more, and a double force of clerks would be required.

An actual over-credit through error, whereby an office is the loser, will always be refunded upon application.

But a seeming over-credit, caused because another office does not check a sufficient amount, or caused by overcharging upon a message (unless such overcharge can be refunded to the customer) will not be refunded.

## A MISSING OPERATOR.

George Woodworth Townsend mysteriously disappeared from Terre Haute, Indiana, on the 24th of January, 1874, since which time all trace of him has been lost. He was an operator and railway clerk; had worked for the L. S. and M. S. R. R.; had filled the position of train despatcher on the Flint and Pere Marquette R. R., and at the time of his disappearance was station agent of the E., T. H. and C. R. R. at Clinton, Indiana. No cause is known to exist why he should secrete himself.

His description is as follows: About 25 years of age; 5 feet 7 to 8 inches high; slender, but probably has matured; bluish gray eyes; fair complexion; regular features; straight nose; slightly projecting teeth, with space between the upper front teeth.

Any information of his whereabouts or fate will be gratefully received by his widowed mother, Mrs. Lucy S. Townsend, Sturgis, St. Joseph Co., Mich., or Lonergan & Thiel, St. Louis, Mo.

## BRAIN AND NERVE ACTION.

M. Helmholtz claims to have ascertained, by most carefully conducted experiments, that sensations are transmitted to the brain with a rapidity of about 180 feet per second, or at one-fifth the rate of sound, and that this is nearly the same in all individuals; also, that the brain requires one-tenth of a second to transmit its orders to the nerves which preside over voluntary motion, this amount varying, however, much in different individuals, and in the same individual at different times, according to the disposition or the condition at the time, and is more regular the more sustained the attention. M. Helmholtz likewise finds that the time required to transmit an order to the muscles by the motor nerves is nearly the same as that required by the nerves of sensation to pass a sensation; moreover, it passes nearly one-hundredth of a second before the muscles are put in motion. The whole operation requires one and a quarter to two-tenths of a second. It is no mere figure of rhetoric, therefore, to speak of a mind that is active and ardent, or one that is slow or cold.

## STEEL AND MAGNETISM.

At a recent meeting of the French Academy of Science, M. Trève communicated the result of the researches he had undertaken with M. Durassier on the relations which exist between the nature of steels and their coercitive force. M. Durassier prepared fifteen bars of steel divided into five series, differently carburized, of three bars, each one of which had been tempered in a distinct and especial manner. M. Trève magnetized these bars to saturation, and determined their magnetic force by the method

of deflection. The bar, containing 0.95 per cent. of carbon, and tempered in cold water, caused a maximum of deflection, represented by 47. The bar containing the same percentage of carbon, but tempered with boiling water, gave 44. The bar containing the same amount of carbon, but tempered in oil, at 10° centigrade (50° Fah.) gave 43. The relation of hardness to power to retain magnetism is, therefore, manifest. The influence of the percentage of carbon in each bar is not less, for the bar containing 0.95 per cent. gives a maximum of 47, while that containing only 0.25 per cent. gives 18. In preparing diagrams of variations for the different series of bars, the influence of the percentage of carbon and the tempering liquid became manifest. It was remarked, however, that, at the top of the scale in carbon, the nature of the tempering liquid no longer exerted a very marked influence; 47, 44 and 43, are very near one to the other; coercitive force is but little manifest in steels whose percentage of carbon exceeds from 0.5 to 0.55 per cent. Another remarkable fact is the similarity of the magnetic curves and curves of elasticity of the bars. Carbon gives elasticity to the steel, and, at the same time, a capacity for magnetism.

## THE COKE-MANGANESE GALVANIC CELL.

The well-known Leclanche's cell is now in use for many purposes, giving a very constant current, but which, however, is much decreased by the resistance of the tar covering the top of the porous cell, and by the decomposition of the manganese dioxide, which is transformed during the action of the cell into oxide; the latter oxide closes the pores of the cell. Sergius Kern's cell is a modification of Leclanche's one, and the experiments proved it to act very constantly.

Two parts of cleanly washed coke and one part of manganese dioxide in the shape of powder are well mixed together with a small quantity of water acidulated with some drops of nitric acid; the mixture then is strongly pressed into brown paper cartridges 5 inches high and 1¼ inches diameter. The resulting coke manganese cylinders are dried in a warm place, but not over a fire, because the heat, as it is known, decomposes the manganese dioxide.

The dried cylinders are placed in glass jars containing concentrated solution of ammonium chloride, and surrounded with zinc plates curved in the usual manner. By this arrangement the use of porous cells is avoided, and a battery of such elements acts more constantly, besides this, the construction of it is cheaper. Instead of having the glass jars, Kern uses wooden boxes the size of the glass jars; the internal parts of the boxes are covered with the following mixture, melted in an iron cup: 2 parts of wax, 10 parts of common resin (colophony), 2 parts of red lead, and ¼ part of gypsum.

The zinc of the element is the negative pole; the coke, the positive pole.

A VERY ingenious application of electro-metallurgy has recently been brought before the notice of the Society of Arts. It consists in the application of a coat of silver, by means of electro-deposition, on natural leaves and flowers. By this means very delicate ornaments are produced, since the precise form and texture of the natural leaf is preserved under the thin silver film.

SOME of the large sugar manufactories of Paris are now illuminated at night by the electric light, obtained from the Gramme machine. The apparatus requires from 1 to 1½ horse power, and is driven from the engine the same as any other piece of machinery.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Day street, New York, June 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Benton, Ala., closed.  
Van Winkle, B. C., closed.  
Black River, C. B. I., closed.  
Cape North, " "  
Indian Brook, " "  
Lingan, " "  
South Sydney, C. B. I., given in tariff book, should read Sydney.

St. Augustine, Fla., closed.  
Pilatka, Fla., reopened.  
Blackshear, Ga., reopened.  
Bartow, Ga., square 246, (new office in JOURNAL of April 1, 1875,) is in Bartow Co. P. O. A. is Stegalls.  
De Soto, Ka., closed.  
Lafourche, La., closed.  
Pimlico, Md., closed. (Given as Pamlico when the office was opened).

North Adams, Mich., reopened, square 231.  
Marion, Miss., closed.  
Wahalak, Miss., closed.  
Messages taken for Ivory and Nazareth, Mo., are delivered from Jefferson Barracks. Charges for delivery 25 cents and 75 cents respectively from Jefferson Barracks.  
Blacklands, N. B., reopened.

The tariff to or from the summer offices in White Mountains, N. H., viz., Bethlehem, Crawford House, Fabian House, Glen House, Mt. Washington, Mt. Washington Depot, Profile House, Twin Mountain House, and Waumbek House, which will be open for business from July 1st to Sept. 30th only, will be 30 cents more than the usual square rates.

Central Valley Junction, N. Y., closed.  
The office printed in tariff book as Chatham 4 Corners, N. Y., should read Chatham Village.

South Granby, N. Y., reopened, square 74.  
Collamer, O., changed to Collinwood.  
Carroll, Ottawa Co., O., changed to La Carue.  
Baconsbury, O., changed to Cortland.  
Doylestown, O., closed.

Frankfort, O., reopened. } 50 3 from Cincinnati.  
                                      } 30 2 from Chillicothe.

Londonderry, O., closed.  
Hereafter the tariff for other lines to McArthur, O., will be 75 and 5 from Marietta and Portsmouth or, 65 and 5 from Chillicothe, (in place of that given in tariff book).

Pettisville, O., closed.  
Bainsville Station, Ont., closed.  
Balmoral G. T. R., Ont., closed.

Collins Bay, Ont., closed.  
Dartford, Ont., closed.

Fredericksburg Station, Ont., closed.  
Gladstone Station, Ont., closed.  
Glen William, Ont., closed.

Perch, Ont., closed.  
Rideau Station, Ont., closed.  
Saxony, Ont., closed.

Smithfield, Ont., closed.  
Linwood, Pa., closed.  
Hereafter business for Schenck's will be checked to Bristol.

Mooreheads, Pa., reopened, square 150.  
Wernersville, Pa., in tariff book, should read Wernersville Mountain House. There is no office at Wernersville: Messages for the latter are delivered from the Mountain House office; Charges for delivery 50 cents.

St. Fabien, Que., closed.

A notice given in JOURNAL of June 15th, 1875, changed the square of Huntington, W. Va., from 308 to 183. Managers who have not already done so, should make the necessary correction in their tariff books at once.

## SUMMER OFFICES REOPENED.

\* Sea View House, West Haven, Conn.  
39 Lake George, N. Y.  
57 Trenton Falls, N. Y.  
98 Minnequa Springs, Pa.  
38 Highgate Springs, Vt.  
39 Lake Dunmore House, Vt.  
Capon Springs, Va., 25 cents more than Winchester.  
\* Rowley Springs, Va.  
106 Berkeley Springs, W. Va.

## NEW OFFICES.

\* Stanley, B. C., 125 50 from Laconner, W. T.  
Downey City, Cal.  
Gonzales, " "  
Hueneme, " "  
Marshall's, " "  
Pigeon Point, " "  
Big Pond, C. B. I., tariff 30 cents more than square rate to Port Hastings, check direct.  
\* Lorway, C. B. I., 30 2 from Sydney.  
\* Louisburg, C. B. I., 30 2 " "  
\* Schooner Pond, C. B. I., 30 2 " "  
\* Fort Meade, Fla., 150 10 from Lake City.  
196 Bartow, Jefferson Co., Ga.  
261 Liberty Mills, Ind.  
\* Abbott, Iowa, 45 3 from Marshalltown.  
\* Albion, Iowa, 30 2 " "  
\* Coal Bank, Iowa, 50 3 " "  
\* Chapin, Iowa, 65 4 " "  
\* Eldora, Iowa, 35 2 " "  
\* Faulkner, Iowa, 55 4 " "  
\* Geneva, Iowa, 60 4 " "  
\* Gilman, Iowa, 20 2 " "  
\* Hampton, Iowa, 65 4 " "  
\* Liscomb, Iowa, 25 2 " "  
387 Luzerne, Iowa.  
\* Northwood, Iowa, 85 6 from Marshalltown.  
\* New Sharon, Iowa, 35 2 " "  
397 Pulaski, Iowa.  
\* Rockwell, Iowa, 70 5 from Marshalltown.  
\* Sheffield, Iowa, 70 5 " "  
\* Steamboat Rock, Iowa, 40 3 " "  
\* Searsboro, Iowa, 30 2 " "  
\* Union, Iowa, 30 2 " "  
446 Endora, Kas.  
\* Ringgold, La., 50 4 from Minden.  
\* Lewiston Junction, Me., 25 1 from Portland, Mont. Co.  
85 Ichester, Md.  
54 Marion, Md.  
230 Bedford, Mich., check Battle Creek.  
270 Corey's, Mich.  
230 Geddes, Mich.  
240 Leoni, Mich.  
240 Marengo, Mich.  
270 Pokagon, Mich.  
\* Christopher's Brook, N. B., 30 2 from Sackville, Mont. Co.  
41 Demarest, N. J.  
46 Glenwood, N. J.  
\* Constableville, N. Y., 25 1 from Utica, Mont. Co.  
45 Fultonville, N. Y.  
\* Guilderland, N. Y., } 30 3 from Albany.  
                                      } 50 3 from Binghamton.  
46 Highland Mills, N. Y.  
45 Spraker's Basin, N. Y.  
192 Cheshire, O.  
169 Collinwood, O., (formerly Collamer).  
159 Cortland, O., (formerly Baconsbury).  
211 La Carue, O., (formerly Carroll, Ottawa Co.)  
170 Quaker City, O.  
\* Erinsville, Ont.  
\* Ethel, Ont.  
\* North Lancaster, Ont.  
\* Ocean House, Burlington Beach, Hamilton Harbor, Ont.  
59 Paschalville, Pa.  
\* Sandy Beach, Que.  
\* St. Henedine, Que.  
\* St. Remi Village, Que.  
496 Harwood, Texas.

We are notified by those in charge of the lines in Mexico, that messages from private parties, which direct or indicate the payment of an sum of money, are considered by the Mexican Government as drafts or bills of exchange, and are taxed according to the amount represented, as follows:  
From \$10.00 to \$100.00, 3 cents; for each additional hundred or fraction thereof, 3 cents.

All other messages, including those which are an acknowledgment of the payment of a draft or bill of exchange, note, letter order or telegram, are subject to a tax of one cent per message.  
Managers accepting messages for Mexico will therefore collect sufficient to pay the tax required.

WILLIAM ORTON, *President*.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
NEW YORK, June 7, 1875.

On and after June 15th, Brady's Bend, Pa., will be discontinued as a money order office.

GEO. H. MUMFORD,  
*Vice-President*.

## TO ALL SUPERINTENDENTS AND MANAGERS.

Hereafter, notice must be sent to J. B. Van Every, Auditor, by postal card, of every remittance to the Treasurer.

These notices must, in every case, be mailed on the same day that the remittance is sent.

They will not take the place of blank No. 65, which must be enclosed with the remittance, as hitherto.

The advice which has heretofore been sent (by some offices) to the Treasurer separately from the remittance may be discontinued.

R. H. ROCHESTER, *Treasurer*.

NEW YORK, June 15, 1875.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

NEW YORK, June 10, 1875.

## ASSESSMENT No. 76.

4, 5, 8, 16, 28, 53, 56, 64, 74, 76, 77, 86, 88, 90, 95, 103, 121, 122, 131, 143, 146, 157, 181, 183, 208, 211, 217, 235, 269, 276, 277, 280, 289, 301, 349, 351, 383, 385, 414, 464, 467, 509, 510, 532, 536, 546, 549, 553, 555, 564, 576, 587, 597, 615, 626, 667, 708, 740, 808, 812, 890, 898, 899, 873, 896, 915, 916, 917, 923, 923, 977, 1013, 1034, 1038, 1089, 1074, 1076, 1126, 1127, 1154, 1173, 1178, 1182, 1199, 1252, 1260, 1266, 1298, 1300, 1306, 1333, 1345, 1367, 1368, 1394, 1409, 1490, 1507, 1508, 1517, 1518, 1522, 1527, 1560, 1562, 1568, 1571, 1579, 1622, 1735, 1815, 1862, 1894, 1900, 1901, 1906, 1944, 1980, 1981, 1984, 1987, 1964, 1970, 1986, 2019, 2030, 2036, 2049, 2057, 2066, 2069, 2097, 2133, 2135, 2138, 2154, 2162, 2164, 2197, 2202, 2228, 2229, 2240, 2241, 2250, 2279, 2281, 2283, 2283, 2287, 2288, 2305, 2310, 2322, 2327, 2342, 2345, 2362, 2371, 2386, 2389, 2395, 2400, 2427, 2428, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441.

## ASSESSMENT No. 75.

13, 19, 26, 31, 39, 51, 52, 70, 75, 80, 82, 84, 97, 99, 101, 112, 120, 129, 154, 156, 158, 160, 164, 171, 185, 186, 187, 189, 190, 191, 193, 197, 198, 206, 227, 228, 230, 240, 248, 252, 274, 278, 279, 281, 282, 283, 285, 316, 323, 334, 341, 342, 344, 350, 356, 357, 360, 361, 362, 364, 366, 383, 411, 412, 426, 441, 456, 478, 482, 484, 511, 512, 516, 533, 556, 557, 573, 575, 584, 590, 600, 617, 618, 622, 642, 646, 648, 652, 652, 663, 664, 665, 667, 669, 678, 680, 695, 697, 701, 705, 710, 712, 722, 723, 724, 728, 730, 733, 780, 781, 783, 786, 790, 791, 800, 801, 802, 809, 813, 820, 821, 823, 826, 828, 848, 876, 897, 904, 905, 906, 927, 929, 931, 939, 944, 949, 954, 957, 959, 963, 964, 979, 980, 992, 1000, 1002, 1011, 1014, 1016, 1080, 1081, 1083, 1084, 1041, 1046, 1050, 1057, 1058, 1063, 1069, 1071, 1080, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1125, 1131, 1139, 1141, 1152, 1155, 1166, 1167, 1169, 1180, 1182, 1185, 1190, 1191, 1210, 1211, 1217, 1224, 1241, 1248, 1255, 1266, 1268, 1269, 1274, 1281, 1283, 1284, 1285, 1286, 1288, 1290, 1307, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1320, 1321, 1322, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1366, 1372, 1396, 1400, 1403, 1406, 1412, 1415, 1417, 1421, 1427, 1438, 1430, 1432, 1433, 1437, 1438, 1457, 1458, 1465, 1469, 1471, 1474, 1476, 1481, 1482, 1483, 1497, 1500, 1501, 1512, 1515, 1528, 1529, 1530, 1537, 1542, 1546, 1556, 1557, 1558, 1570, 1573, 1576, 1580, 1586, 1596, 1597, 1600, 1605, 1607, 1608, 1613, 1618, 1620, 1624, 1639, 1644, 1649, 1652, 1653, 1657, 1666, 1667, 1670, 1673, 1676, 1696, 1700, 1701, 1704, 1714, 1732, 1733, 1737, 1746, 1747, 1750, 1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1765, 1766, 1767, 1769, 1771, 1785, 1788, 1789, 1795, 1796, 1797, 1804, 1818, 1818, 1823, 1824, 1826, 1830, 1837, 1838, 1857, 1858, 1859, 1860, 1863, 1864, 1874, 1877, 1899, 1905, 1908, 1907, 1924, 1945, 1946, 1947, 1953, 1958, 1968, 1972, 1973, 1983, 1987, 1992, 1993, 1996, 1997, 1999, 2000, 2001, 2007, 2010, 2012, 2023, 2029, 2033, 2035, 2040, 2050, 2053, 2074, 2075, 2084, 2095, 2099, 2108, 2123, 2125, 2136, 2187, 2142, 2145, 2151, 2156, 2157, 2169, 2171, 2187, 2192, 2200, 2220, 2225, 2226, 2227, 2230, 2231, 2236, 2237, 2243, 2245, 2246, 2253, 2258, 2267, 2268, 2269, 2271, 2284, 2286, 2291, 2292, 2293, 2299, 2300, 2303, 2304, 2307, 2324, 2325, 2326, 2327, 2340, 2344, 2357, 2360, 2361, 2366, 2368, 2369, 2373, 2384, 2385, 2390, 2393, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2417, 2418, 2419, 2431.

## ASSESSMENT No. 74.

37, 143, 232, 237, 238, 242, 246, 253, 271, 451, 453, 455, 457, 804, 934, 1153, 1608, 1655, 1690, 1691, 1715, 1716, 1731, 1736, 1835, 1941, 1974, 1975, 1976, 2037, 2177, 2220, 2228, 2332, 2353, 2396, 2397.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## TESTS OF INSULATION.

The following figures, being the results of tests over sections of the Southern Division of the Western Company's lines, are deemed worthy of record:

## INSULATION.

Between Washington, D. C., and Richmond, Va.; distance, 115 miles; 12 hours of hard rain over the entire line. March 7, 1875.

No.	Mileage resistance.	Kind of insulation.
1	4,006,140	Pin and glass.
2	4,315,145	"
3	4,006,140	"
4	1,468,140	60 miles Leffert's.
11	5,624,650	Pin and glass.
12	4,675,670	"
13	4,006,100	"

## CONDUCTIVITY.

Same date and time.

No.	Mileage resistance.	Gauge.
1	15.5	8 galvanized.
2	15.0	9 "
3	13.0	8 "
4	16.3	9 "
11	13.1	8 "
12	12.8	8 "
13	13.0	8 "

Between Norfolk and Weldon, distance, 85 miles; Norfolk and Raleigh, distance, 182 miles. April 10th, 1875. Cloudy, damp; rain during the previous night. Therm., 55°.

No.	Mileage resistance.	Kind of insulation.
1	3,773,150	Bracket and glass, No. 9, gal.
2	2,616,800	Kenosha pins on cross arm, 9 gal
3	2,434,400	" " " 8 "
3 to W.	2,079,040	" " " 8 "
1 to R.		" " " 9 pl.
3 to W.	2,451,722	" " " 8 gal
2 to R.		" " " 8 gal

Ap'l 19th, 10 A. M.—Drizzling rain; quite wet. Ther., 51. Rain during past night.

No.	Mileage resistance.	Kind of insulation.
1	3,924,450	Bracket and glass.
2	3,034,900	Kenosha pins.
3	1,966,450	"
3 to W.	2,942,240	" "
1 to R.		" "
3 to W.	2,137,044	" "
2 to R.		" "

Brackets and glass put up in 1867.  
Kenosha put up in 1874.

Between Louisville and Bowling Green, Ky.; distance, 114 miles.

## CONDUCTIVITY.

April 22d, 1875. Weather clear and dry. Ther., 44°.

No.	Mileage resistance.	Kind of insulation.
1	11.8	9 gal.
2	19.1	8 "
4	16.2	8 "
5	19.5	9 "
6	26.2	9 plain.
9	38.5	9 " (way.)

## INSULATION.

Louisville, Ky., April 27, '75, 8 A. M. Distance, 114 miles.

No.	Mileage resistance.	Kind of insulation.
9	806,260	Sq. glass.
1	692,094	"
2	1,591,788	Pin and glass.
5	1,072,968	"
6	3,507,666	"
4	685,416	Sq. glass.

Slow, misty rain during the greater part of the night. Bowling Green reports heavy rain while tests were made.

Louisville to Lexington, Ky., 94 miles.

No.	Mileage resistance.	Kind of insulation.
9	3,172,000	Pin and glass.
6	3,172,000	"
7	2,630,000	Sq. glass beyond La Grange.
10	1,463,840	"

No rain beyond Frankfort.

**MAGNETISM INCREASED BY HEAT.**—In a recent note on magnetism to the French Academy, M. Gauguin says he has succeeded in increasing magnetization by means of heat in certain cases. His method of doing so is as follows: He first magnetizes small bars of steel, placing them with one of their extremities in contact with a pole of a permanent magnet; then determines their magnetic state by finding several points of the curve of demagnetization. Next, he again connects them with the magnet, and heats them with a spirit lamp, puts out the lamp, and lets the bars become quite cool before detaching. He then finds the magnetization greater than when they had not been heated (sometimes even double). The increase does not occur unless the bar remains in contact with the magnet while cooling. If the bar be detached while hot, the magnetism is found to be diminished by the heating.

**CONSTRUCTION OF MAGNETS BY ELECTROLYSIS.**—The late Professor Jacobi proposed to determine experimentally whether, by proper arrangement, precipitated iron can be induced to arrange itself so as to form permanent magnets. The author maintains that he solved the question twelve years ago, and obtained magnets by electrolysis. He find that iron precipitated from a solution of iron containing sal-ammoniac is, in a very eminent degree, capable of permanent magnetism; that precipitated from other solutions of iron is magnetic only in a slighter degree. If the precipitate is obtained under the influence of powerful magnetism—prejudicial circumstances being avoided—strong magnets of homogeneous structure are formed from solutions containing sal-ammoniac. On the other hand, solutions free from sal-ammoniac yield magnets distinguished by their irregular structure, in consequence of which the feeble magnetism of the precipitate is rendered still weaker. A not unimportant degree of coercive power cannot under any circumstances be denied to iron, unless altered in its structure by ignition or other processes. The nature of the solutions themselves must be regarded as the cause of the irregularities of structure. While the sal-ammoniacal solution remains perfectly clear, a solid crystalline layer is separated upon its surface. If pieces are broken off, they fall to the bottom. Solutions of ferrous chloride become turbid, and continually deposit a slimy precipitate upon the electrodes. Klein's solution remains tolerably clear, but upon the surface is formed a slimy foam. If any of this falls down, the electrodes are likewise soiled. Thus the iron precipitate is deprived of its homogeneity, and by partial removal of the impurities—for example by brushing and by the rise of gas bubbles, the formation of partial magnets is explained.—*W. Beetz, in Poggenhoff's Annalen.*

M. SELIM MENSTROM states that the pale light seen over the summits of the mountains of Spitzbergen and Lapland are of the same nature as the aurora. Similar phenomena observed in other regions prove that electric discharges of the same nature as the aurora may occur elsewhere besides in the Arctic regions. The spectroscopic is the safest means of determining the nature of these phenomena in doubtful cases. In the spectrum of the aurora there are nine rays, which probably agree with the lines given by the component gases of the atmosphere. The spectrum of the aurora may be resolved into three different types.

OUR life is determined for us; and it makes the mind very free when we give up wishing, and only think of bearing what is put upon us, and doing what is given us to do.

**WEST INDIA AND PANAMA.**—The traffic receipts of this Company amounted in January, 1875, to £2,838, as compared with £1,488 in the corresponding period of 1874. In February, 1875, the receipts were £3,246, against £1,506 in February, 1874.

THE cable steamship Hooper has arrived in the Millwall Docks, after an expedition of five months in laying the cables of the Central American, West India and Panama, and Cuba Submarine Telegraph Companies.

THE Directors of the Great Northern Telegraph Company have issued an abridged report of the general meeting held at Copenhagen on the 28th April. It goes into details respecting the condition of the cables, &c., and states that the total dividend for the year was fixed at 7 per cent., after an amount had been added to the reserve fund; also that the traffic during 1874 had increased 492,072fr. compared with the previous year, or 27 per cent. It further states that the receipts had increased 567,068fr., or 38 per cent. against 1873.

THERE is every reasonable hope of a telegraphic line being shortly established between the Cape Colony and the Free State.

SOME indignation is felt at the collapse of the Telegraph Cable Company to Aden via Mauritius (Hooper's), and the Ministry at the Cape will have to answer several plain questions about this contract during the ensuing session.

THE "Indo-Australasian Telegraph Company (Limited)" has just been registered, with a capital of £2,000,000, in £10 shares. Its object is the establishment of telegraphic communication between India, Australia and New Zealand, and the intermediate points, in connection with the lines of the Indo-European Telegraph Company (Limited).

THE total number of messages forwarded from postal telegraph stations in the United Kingdom for the week, ended May 8, 1875, was 402,502, an increase on the corresponding week of last year of 26,632.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended May 15th was 406,574, and during the corresponding week of 1874, 375,524, showing an increase in the week of 1875 on that of 1874 of 31,050.

THE total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 22d of May, 1875, and the corresponding week of 1874: May 22, 1875, 386,733; May 23, 1874, 365,452; increase in the week of 1875 on that of 1874, 21,321.

## BORN.

MEEHAN.—At New Iberia, La., May 31, 1875, a daughter to John H. Meehan, Manager W. U. Tel. Office.

SKEGGS.—At Effingham, Ill., May 31, 1875, a son to C. B. Skeggs, Manager W. U. Tel. Office.

## MARRIED.

BURNS.—TRAVIS.—At the residence of the bride's parents, Assumption, Ill., May 26, 1875, by Rev. Mr. Emerson, T. J. Burns, Manager W. U. Tel. Office, Hervey City, Ill., to Miss Ida B. Travis of Assumption.

COOLEY.—SHELLY.—June 2, 1875, in the Methodist Episcopal Church, Thomasville, N. C., by Rev. P. L. Hermon, J. G. Cooley, Manager W. U. Tel. Office, Hillsboro, N. C., to Miss Mary A. Shelly of Thomasville.

ROBSON.—BRESEE.—At Aurora, Ill., May 26, 1875, by Rev. Chas. Button, James P. Robson, Manager W. U. Tel. Office, Millbrook, Ill., to Miss Helen M. Bresee of Aurora.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, JUNE 15, 1875.

### THE REGULAR DIVIDEND.

At the regular meeting of the Board of Directors of the Western Union Telegraph Company, held June 9th, the Acting President made a statement, showing that the earnings of the Company for the year ending June 30, 1875, were \$9,581,774.40, and the net profits \$3,158,932.90. The following resolutions were adopted:

On motion,

*Resolved*, That a dividend of two per cent. from the net earnings of the three months ending June 30th be and the same is hereby declared, payable on the 15th day of July next.

*Resolved*, That for the purpose of such dividend the stock books be closed at three o'clock on the afternoon of the 19th inst., and opened on the morning of the 16th of July.

The attention of Superintendents and Managers is directed to the notice in another column from the Treasurer concerning remittances.

At last the Direct United States Cable is completed, and communication is said to be perfect. It has not yet been opened to public use.

### THE INTERNATIONAL TELEGRAPHIC CONFERENCE.

The International Telegraphic Conference met at St. Petersburg on June 2d, every European country with governmental systems of telegraph being represented. The delegates have been entertained at a dinner by the Czar. No account of the proceedings of the Conference has as yet reached us.

### THE PRINTING TELEGRAPH INSTRUMENTS DUPLEXED.

Several attempts have been made during the past two or three years to apply the "Duplex" to the Combination Printing Telegraph instruments. The results obtained showed conclusively that the application could be made successfully, the principal objection to its practical use being the mutilation of the printed slips by "breaks" from the distant stations. This objection has been completely removed by an ingenious application of the "Quadruplex" system to the printing instruments, by means of which the receiver at either end of the line can at any time "break" his sender without in any manner interfering with or attracting the attention of the other two operators. This system has now been in practical operation on the New York and Boston circuit for the past two weeks, with eminently satisfactory results.

The oldest and most experienced operators in the printing service express the opinion that with the new system their work is performed more easily and satisfactorily than by the ordinary method of single transmission.

This begins a new era for the printing telegraph system in this country.

### BASTIE'S NEW PROCESS OF TEMPERING GLASS, AND ITS APPLICATION TO TELEGRAPHY.

Prof. T. Eggleston, of the School of Mines in this city, has made a long and systematic series of experimental investigations into M. Bastie's new process of tempering glass. He found that ordinary window glass, after having been subjected to the process, would resist the shock of a two-ounce steel cylinder dropped from a height of fifteen feet, and a pound cylinder from a height of seven feet, while an ordinary pane would resist only 30 inches fall of a two-ounce ball. It can be heated to any temperature without breaking. A curious feature of glass thus treated is, that it can be thrown to almost any distance without fracture, but if it does break, it flies literally to atoms. Prof. Eggleston read a paper a few days since before the Institute of Mining Engineers, in which he gave the above and many other interesting particulars in regard to this new discovery.

It appears that glass of any form or quality may be treated successfully, and that its properties as a non-conductor of heat are enormously increased. This would render it probable that its insulating properties are increased also, these two qualities being apparently proportional to each other in most, if not all, known substances.

The prospective value and importance of this discovery to telegraphic interests can scarcely be over-estimated. Glass is very extensively used in telegraphy, mainly for line insulators and battery jars, and the loss by breakage in these two items alone, to a company like the Western Union, amounts to a very large sum of money annually. By the aid of this new discovery the average insulation of the wires may

be vastly improved, for not only will cracked and broken insulators become a rarity, but the form of the insulators themselves may be greatly modified with advantage. One great difficulty has hitherto been, that the disposition of material best adapted to secure good insulation—that of a hollow cylinder of great length and small diameter—is most unfavorable in respect to mechanical strength, and for this reason we have hitherto been obliged to make a compromise in form, which materially reduces the electrical resistance of the insulator during rain. The new process of tempering the glass will afford great possibilities of improvement in this respect. There are also many minor applications of this substance that will suggest themselves from time to time; for instance, as a substitute for hard rubber in the manufacture of electrical and telegraphic apparatus. Further developments of the capabilities of this extraordinary discovery will be awaited with great interest.

PRESIDENT ORTON, accompanied by his two daughters, arrived from Europe by the White Star steamer Celtic Monday morning, June 14th, all much benefited by their trip across the sea. On arriving at their country home, in Irvington, a magnificent dinner service, consisting of 13 pieces of solid silver, from the Gorham Manufacturing Company, of great elegance and finish, and bearing on each the family monogram, was presented to Mr. Orton and family by the Directors and officers of the Western Union Telegraph Company. It was designed to have presented this service on the 23d of May, that being the silver wedding day, the twenty-fifth anniversary of Mr. and Mrs. Orton's marriage, but was delayed by Mr. Orton's absence. It was accompanied by a kind and appreciative letter by Acting President Cornell on behalf of the gentlemen who thus testified in this timely way to their united appreciation of and respect for their associate in labor and his family. It was one of the felicities of this presentation, the more so because unknown to the donors, that the day on which it was made was Mr. Orton's birthday.

AMONG recent patents we notice the combined envelope and blank, by W. L. Gross and W. W. Kelchner of Springfield, Ill., who send us specimens. The value of such contrivances can only be determined by experience, which we do not have, and cost, which we do not know. We shall not attempt, therefore, to estimate the value of the one before us, the claims of which are probably based on economy and convenience. Of such inventions we have first to ask, "Has it been tried?" and then, "What are its advantages?" Let some one answer these questions. We are inclined to think well of anything coming from the gentlemen named—as its legal parentage.

THE Government telegraph line from Denison, Texas, to Fort Sill has just been completed to Fort Richardson, Indian Territory, 114 miles west of Denison, and, it is expected, will reach Fort Sill by the first of June.



## IMPROVING THE SERVICE.

As time passes away, all enterprises which have within them possibilities of growth find new conditions arising to demand careful and intelligent provision. So far the telegraph has pushed its way by the impetus of necessities clearly discerned and readily supplied. Material has been abundant. In the natural quickness and aptitude of American youth there has been no lack of supply for the manning of its offices. Were it not that large numbers annually pass from the telegraph service into new relations or into business of more seemingly ultimate promise, there would be, as there is, to some extent, a plethora of unemployed telegraphic labor. The material for the outside structure has been easily provided. Canada has given her forests for poles, and England and America fabulous quantities of wire. Every material has been abundant.

But a new era comes. And now Science, hitherto comparatively inert, awakes and sees the need of making more out of its present means. Hence comes the Duplex and the Quadruplex. We can, happily, already see in them, as Tyndall says, the promise and potency of the future. The quadruplex may be only the prophecy of the multiplex. But now comes a field of enquiry so far left untouched. We have to see whether the quadruplex in the machine may not have some correlation in the man.

We think no one will deny that many of the most efficient of all existing operators have sprung from the ranks of the messenger. Why should it be otherwise? The messenger, if intelligent, imbibes, in the performance of his duties, the very genius of the business. Even the abuse he sometimes encounters educates him into a thorough idea of the value of his work. In the agitation, and haste, and joy, and anguish, and in the unreasonableness, often, of the receivers of telegrams at his hands, he learns the art and necessities of a service which must hold prime importance in the management of the telegraph of the future. Certain tests, carefully made, prove incontestibly that in the handling of the messenger department alone there is possible a vast expansion of business. In the messenger force, also, we believe must be found the true recruiting source of the other departments. By adopting the business in early life they become thoroughly wedded to it as their future work. The duties of the messenger service eminently qualify for a comprehension of all other telegraphic labor. The value of time, correctness, assiduity, push, become a part of him. He carries it with him to the key and the managership. Here then will executive attention be led in planning an effective national system in which the quality of labor must form an essential part and largely determine its vigor. The messengers must be selected for their aptitude, for their energy and sharpness, for their zeal and intelligence. They must be able to write and read readily, and from them, after a fair service as messengers, must come, after competent training, the future operator, and manager, and superintendent. Such a vastly advance the vigor of the service.

## MECHANICAL AND ELECTRICAL TESTS OF AMERICAN IRON WIRE.

The following table contains a summary of the results of a series of mechanical and electrical tests recently made upon four samples of galvanized wire of American manufacture, the sizes being among those commonly used in telegraphic construction:

Sample Mark.	MECHANICAL.				ELECTRICAL.	
	Weight per Mile (lbs).	Breaking Strain (lbs).	Per Cent. of Elongation.	No. of Twists (6 in.).	Per Cent. Conductivity Pure Copper = 100.	Resistance per Mile Ohms at 60 deg. Fah.
151	282.8	780	10	25	21.9	16.1
146	297.5	825	16	26	21.6	16.1
		840		27		
A H	298.5	1260	16	28	15.1	22.7
443	378.1	1355	10	29	16.5	16.1
		1640		30		
		1680		31		

The above results seem to point to one very interesting as well as important fact, viz., the close relation existing between the tensile strength and the electrical resistance of iron wire. It will be observed that the first three samples tested are of nearly the same gauge or weight per mile, the size being that usually designated as No. 9½. The tensile strength or breaking strain of the third sample is some 50 per cent. greater than that of the first two, while its specific electrical resistance is also comparatively very high. The proportionate tensile strength of the last two samples is very nearly equal, and so also is their proportionate conductivity, as compared with pure copper, as shown in the sixth column of the table. There seems to be no apparent relation existing between the conductivity or tensile strength of the several wires, and the percentage of elongation, or the number of twists that a given length will sustain before breaking.

The high conductivity of the first two samples is very remarkable. The conductivity of iron is generally assumed by the best authorities to be one-seventh that of pure copper, or about the same as that of the third sample, but it will be observed that the first two samples have a conductivity averaging nearly 22 per cent. that of pure copper. Thus the first samples (No. 9½), weighing but 282.8 lbs. per mile, actually has as much conducting power, mile for mile, as the fourth sample (No. 8), weighing 378.1 lbs per mile.

GEORGE B. PRESCOTT.

The annual parade and inspection of the employés of the American District Telegraph Co. will take place on the morning of July 5th. The line will be reviewed by the officers of the Company, and the inspection and exhibition drill will take place in the City Hall Park.

## ACTION OF THE W. U. TELEGRAPH CO. ON THE DEATH OF HON. EZRA CORNELL.

At a meeting of the Board of Directors of the Western Union Telegraph Company, held in the City of New York on the tenth day of March, 1875, the death of the Hon. Ezra Cornell of Ithaca, one of the founders of practical telegraphy, and for many years a prominent and influential director of this Company, was appropriately announced, and on motion it was

*Resolved*, That this Board, at this its first meeting after the demise of our beloved associate and friend, revert to the sad event to express, so far as words will permit, the hearty tribute of our affection for his memory. The records of this Board testify to his energy, his faith and courage in the great struggle to conquer adversity and achieve success in an enterprise regarded at first as chimerical, but which he foresaw was in the end to triumph and enure to the benefit of his country and the world. It is meet and eminently proper, therefore, that we, his successors, holding the records of his labors and achievements in telegraphy, and representing the vast interests which have grown mighty and strong in his life-time, should gratefully acknowledge the obligation not only of ourselves, but of the country and mankind, to his discernment, fidelity and perseverance.

*Resolved*, That we deeply sympathize with the afflicted family of the deceased, and tender to them in their bereavement our sincere condolence.

*Resolved*, That this note of our respect be entered upon the minutes of the Board, and a copy thereof furnished by the Secretary to the family of Mr. Cornell.

## TELEGRAPHIC TEST OF CHRONOMETRIC TIME BETWEEN PERSIA AND ENGLAND.

Some idea of the ramifications of the electric telegraph may be gathered from an experiment successfully accomplished in London a few weeks since. Capt. Sartorius, at present in Teheran, Persia, wished to test his pocket chronometer, and to check, with absolute correctness, its time in Persia with Greenwich time. To do this it was necessary to have a clear line from Teheran to London, a distance by "wire" of nearly 4,000 miles. After some little trouble in getting the German relays into satisfactory order (the lines come through Berlin), the important signal was made several times to insure accuracy, with the result that the watch was found to be two seconds slow by Greenwich time. The experiment was of double interest, as it also tested the performance of a watch which has been constructed on a plan calculated to withstand a great deal of comparatively rough usage, and yet keep time with sufficient accuracy for many scientific observations. The watch was a half chronometer double-rolled lever, made by Messrs. Barraud & Lund.

**FAULTS OF CONSTRUCTION IN BATTERY CONTACTS.**—Emile Girouard points out that one great obstacle in the way of our obtaining cheap electricity lies in the defect of the contacts. The rivets which connect the zinc to the carbon are often ill made, and after having been in use for some time, they are corroded all around, and the oxidation prevents the contact from being perfect. The current, consequently, is unable to pass, unless the tension is considerable enough to overcome the bad conductivity of the oxides. The author proposes to obviate these defects by having all connections, etc., made of platinum.

## THE SERVICE.

WESTERN UNION TELEGRAPH COMPANY,  
APRIL, 1875.

## APPOINTMENTS.

A. Dillon, Broadway & Dey st.	Geo. Morgan, Burning Springs
W. R. Farree, " "	W. Va.
J. E. Hurley, " "	J. J. Wilkes, Frost, Tenn.
A. J. Smith, " "	A. R. Franke, Burlington, Ia.
A. J. Bailey, 14 Broad st.	A. McIntyre, " "
J. E. Hurley, Corn Exchange.	S. M. Goddard, Galesburg, Ill.
J. P. Kohler, " "	A. T. Whittall, Oakaloes, Ia.
Laura Cummings, Pecks' N. Y.	A. J. Anthony, Sparland, Ill.
H. R. Miller, Round Lake, " "	T. McRobie, Chicago, " "
H. M. Stiles, Lawrence, Mass.	Miss A. Patuck, Chicago, " "
S. S. Costello, Newb'port, " "	A. V. Carr, Jacksonport, Ark.
Miss C. I. Bugbee, Boston, " "	K. E. Hagerland, Jefferson, Tex.
J. F. Shorey, " "	C. E. Dodd, Kansas City, Mo.
Wm. Adams, E. Br'kfeld, " "	R. W. Irwin, St. Louis, " "
Miss P. Wood, Falmouth, " "	D. A. Williams, St. Louis, " "
Geo. Wheelock, Fall River, " "	M. S. Bacon, " "
Miss M. A. Williams, New	D. Campbell, " "
Hartford, Ct.	F. B. Moxen, " "
T. W. Greene, Newport, R. I.	W. S. French, " "
Wm. Sperry, New Haven, Ct.	Bella Wise, " "
J. A. Wright, " "	W. H. Carse, " "
J. T. Bailey, Providence, R. I.	H. F. Small, " "
Mrs. Parker, Woonsocket, " "	E. Crawford, Elkhorn, Neb.
M. R. Cronin, Worcester, Mass.	E. Backus, Lone Tree, " "
A. H. Fizzell, Groveton, N. H.	E. E. Pomeroy, Papillion, Neb.
R. B. White, Leicester Jct., Vt.	D. W. Longwell, Amer. Trans.
R. G. Scott, Lexington, Mass.	Station, Neb.
W. H. Wheeler, Springfield, Vt.	E. E. Downs, Armstrong, Pa.
C. C. Butler, Windsor, Vt.	A. E. Wiese, Petrolia, " "
Jno. Witford, Chester, N. S.	J. Suzenstann, Buffalo, N. Y.
A. S. Rileigh, Enniskillen, N. B.	C. H. Billings, Cleveland, O.
Miss A. Stevenson, St. Andrews,	G. A. Leid, " "
N. B.	G. W. Patterson, " "
N. Stanley, Kingston, N. C.	C. L. Lull, East Saginaw, Mich.
C. W. Owen, Mechums River,	W. E. Stoddard, Erie, Pa.
N. C.	F. Leach, Kalamazoo, Mich.
J. B. Flesham, Norfolk, Va.	J. D. Eby, Erie, Pa.
C. E. Williams, Polkton, N. C.	Mrs. L. Grannis, Spring Lake,
J. L. Singleton, Reidsville, " "	Mich.
J. W. Haynes, Williamsons, Va.	Miss J. C. Adams, Saginaw
L. Parker, Baltimore, Md.	City, Mich.
Jno. Beck, " "	A. E. Pinney, Summit, Mich.
A. M. Pennock, Chester, Pa.	J. J. Powers, Toledo, O.
M. Bryan, Leighton, " "	P. P. Clohessey, Toledo, O.
A. Jarrall, " "	C. H. Moore, " "
F. Moody, Philadelphia, " "	G. C. Melx, Jamesville, N. Y.
C. H. Mansen, Townsont'n, Md.	D. Shaw, Oriskany, " "
J. E. Foley, Baltimore, " "	W. L. Ives, Seneca Falls, " "
F. Coates, Harrisburg, Pa.	J. M. Hill, Marion, Ind.
J. J. Loughery, Phila., Pa.	H. E. Branch, Terre Haute, Ind.
W. Barrow, Thomasville, Ga.	J. W. Scott, Cambridge, O.
J. T. Speer, Water Valley, Miss.	A. D. Guthrie, Cheshire, O.
J. L. Mason, Green Springs	B. B. Glass, Cincinnati, " "
Run, W. Va.	C. H. Moore, Hanging Rock, O.
J. J. McKinney, Richmond, Ky.	

## RESIGNATIONS.

D. H. Bates, Philadelphia, Pa.	A. S. Miller, Leighton, Pa.
J. C. Douglass, B'way & Dey st.	B. F. Fleming, Mt. Pleasant.
S. H. Edmonds, " "	S. R. Dupree, New Castle.
H. Giles, " "	D. H. Bates, Philadelphia, Pa.
J. McKeog, " "	J. Wintle, " "
Alice Goodell, " "	H. Shusler, " "
S. S. Springsteen, " "	E. F. Bond, Townsontown, " "
J. W. Little, Brewsters, N. Y.	A. Campbell, Columbia, S. C.
I. W. Green, Lawrence, Mass.	J. B. Helms (dead), Thomas-
Miss D. H. Snow, Newburyport,	ville, Ga.
Mass.	J. A. Barnes, Eufala, Ala.
Miss H. M. Chapman, Boston,	G. M. Eitmeier, New Orleans,
Mass.	La.
J. A. Elms, Boston, Mass.	B. B. Glass, New Orleans, La.
F. H. Goddard, East Brookfield,	M. Folly, " "
Mass.	W. W. Wells, Water Valley.
H. Whiting, Falmouth, Mass.	Jno. W. Pace, Girondale, Miss.
E. A. Conway, Fall River, " "	J. W. Smith, Burning Springs.
G. W. Williams, Jr., New Hart-	B. M. Poynter, Frost, Ten.
ford, Ct.	—Morgan, Burlington, Ia.
M. M. Downer, New Haven, Ct.	—Walt,
Miss M. A. Carpenter, Woon-	—Lemereux, Galesburg, Ill.
socket, R. I.	A. J. McRavey, Milwaukee, Wis.
C. S. Sherbourne, Worcester,	M. Collins, " "
Mass.	F. B. Goodrich, U. S. Yards, Pa.
C. M. Oswell, Groveton, N. H.	C. O. Andrews, Chicago, Ill.
J. T. Murray, Leicester Jc., Vt.	J. Handorbeck, " "
C. F. West, Lexington, Vt.	J. Morrison, Jacksonport, Ark.
F. W. Porter, Springfield, Vt.	—Seaver (dead), Sup., C. & A.
J. S. Welsh, Windsor, " "	R. R.
Miss C. Hamm, Chester, N. S.	E. Curtis, Denver, Col.
W. B. Miles (dead), Westfield,	A. H. Elliott, Kansas City, Mo.
N. B.	C. J. Lawson, St. Louis, " "
A. J. Smith, B'way & Dey st.	F. B. Noxon, " "
R. Lipcomb, Kingston, N. C.	W. S. French, " "
D. P. Beekman, Mechums	Jno. McNulty, " "
River, N. C.	J. C. McIlvaine, " "
D. W. Clapp, Morrisville, N. C.	C. Berry, " "
J. L. Singleton, News Ferry,	E. Parker, Lone Tree, " "
Va.	J. A. Steele, Omaha, Neb.
C. R. Morton, Norfolk, Va.	A. T. West, Papillion, " "
P. J. Fete, Polkton, N. C.	G. A. Brooks, Millertown, Pa.
J. W. Riley (dead), Reidsville,	E. Rogers, Petrolia, " "
N. C.	R. H. Thresher, Buffalo, N. Y.
J. M. Hudspeth, Williamsons,	A. B. Grewald, " "
Va.	C. H. Mead, " "
C. W. Trel, Concord, N. C.	G. W. Jones, Cleveland, O.
R. S. Dobson, Lexington, N. C.	A. Fitzgerald, " "
W. C. Galloway, Thomasville,	E. P. Cole, Kalamazoo, Mich.
N. C.	R. H. Lee, Spring Lake, " "
J. J. Heiner, Philadelphia, Pa.	C. B. Dare, Toledo, Ohio.
G. A. Beer, Altona, " "	D. Burgess, Jamesville, N. Y.
F. F. Beagle, Baltimore, Md.	R. A. Kimber, Seneca, Falls, " "
W. Hamilton, " "	G. L. Campbell, Cambridge, O.
C. E. Pippin, " "	G. B. Swoop, Hanging Rock, " "

## TRANSFERS.

From	To
J. W. Potter, Tallahassee, Fla.	Lake City, Fla.
J. P. Morrison, Jacksonport, " "	Nebraska, Neb.
Ella M. March, Saginaw City	Detroit, Mich.
M. S. Bacon, Nebraska, Neb.	St. Louis, Mo.
J. T. Buchanan, Enniskillen, N. B.	Westfield, N. B.
M. Waycott, St. Andrews, N. B.	St. Johns, N. B.
G. A. Coll, Broadway and Dey st.	14 Broad st.
H. Fitchett, Corn Exchange	B'way and Dey st.
T. E. Keouber, Harlem	Mott Haven, N. Y.
A. A. Smith, Broadway and 94th st.	B'way and Dey st.
Wm. Talcott, Cotton Exchange	" "

## FIGURES PRINTED BY LIGHTNING.

Persons who are killed by lightning stroke are frequently found marked about the body in a peculiar manner, the lines being grouped into semblance of the trunk and branches of a tree. In case the casualty actually happens anywhere in the vicinity of a tree, the ramifications are attributed to some mysterious property of the lightning, which reproduces on the body (as was stated in a published instance) "the fibres, leaves and branches with photographic accuracy."

Mr. C. Tomlinson in a communication to *Nature*, states that the trees have nothing to do with the figures, which are produced directly by the lightning. The same markings may be found in sheets of crown glass by pressing over them the contents of a Leyden jar. The writer, however, mentions a variety of curious phenomena in which horseshoes, metallic numbers, etc., have been found reproduced on the persons of people struck in their neighborhood. Mr. C. F. Varley throws light on these last mentioned cases in giving the record of an accidental observation made during the working of a Holtz electrical machine, the poles of which were furnished with brass balls about an inch in diameter. Noticing some specks on the ball of the positive pole, Mr. Varley tried to wipe them off with a silk handkerchief, but in vain. He then examined the negative pole, and discovered a minute speck corresponding to the spots on the positive pole. This pole sometimes exhibits a glow; and if in this state three or four bits of wax, or even a drop or two of water, be placed on the negative pole, corresponding non-luminous spots appear on the positive pole. Hence it is evident that lines of force exist between the two poles, by means of which we may telegraph through the air from the negative to the positive pole. And in explanation of the above cases, in which the lightning burn on the skin is of the same shape as the object from which the charge proceeded, all that is necessary is that the object be + to the horse shoe, brass number, etc., the discharge being a negative one.

**ELECTRICAL PROPERTIES OF THERMAL SPRINGS.**  
—The water of thermal springs is sometimes possessed of remarkable electric properties, as appears from recent observations of M. M. Thury and Minich, at Baden, Switzerland. They inserted two platinum electrodes (connected with a galvanometer), one in a thermal spring, the other in the River Limmat, and a continuous deflection of 74° was obtained. Later, when the electrode in the spring got covered with bubbles, the needle went back to 60°; but it returned to 70° again when the bubbles were removed. The thermal water was shown to be negatively electric. Fresh and still warm mineral water in a vessel was also found to be negatively electric to cold river water in another vessel. The deflection was 44½°, and came down to zero as the mineral water cooled. Polarization was here not the cause of return of the needle. When the cooled water was heated to 47° Cent. no current was obtained with the cold water. Nor, again, did heated water that was charged with carbonic acid give a current with cold water. It would therefore appear that the electricity in ques-

tion depends neither on a thermo-electric action nor an action of carbonic acid on the electrodes. Further experiment is required to explain it sufficiently.  
—*English Mechanic.*

WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, June 9th, 1875.

## DIVIDEND No. 33.

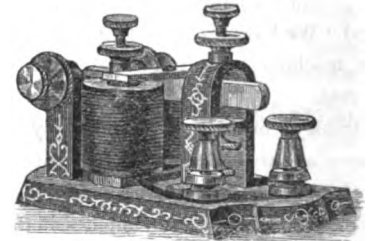
THE BOARD OF DIRECTORS have declared a Quarterly Dividend of **TWO PER CENT.** on the Capital Stock of this Company, from the net earnings of the three months ending June 30th instant, payable at the office of the Treasurer, on and after the 15th day of July next, to shareholders of record on the 19th day of June. The transfer books will be closed at three o'clock on the afternoon of the 19th inst., and opened on the morning of the 16th of July.

R. H. ROCHESTER,  
Treasurer.

**WANTED—BY YOUNG MAN, FAIR OPERATOR, PLACE** with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 140, Janesville, Wis.

## A Great Reduction in Prices.

I am now making a specialty of my PHIL. SHERIDAN SOUNDER and KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



PHIL. SHERIDAN, \$4.00.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether it is a first-class instrument. The magnets are wound with green silk insulated wire.

## Polished Rubber Covers, 50c. Extra.



PHIL. SHERIDAN KEY, PRICE \$2.00.

You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, &c., &c. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Calland Battery, 1 lb. Blue Vitriol, Connection Wire, Book of Instruction, &c., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering, please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

A. B. LYMAN,  
91½ SENECA ST., Cleveland, Ohio.

**REMOVAL.****GEO. H. BLISS & CO.**

We respectfully announce our removal to 230 Kinzie Street, Chicago, Ill. Having determined to transfer our interests to the Western Electric Manufacturing Co., we offer our entire stock of Telegraph Instruments, Goods and Machinery for sale upon terms which cannot fail to prove desirable to purchasers. Until our stock is disposed of we shall continue in the trade, and solicit a continuance of the patronage which has been so liberally bestowed by our many friends heretofore.

GEO. H. BLISS, Pres't.

230 KINZIE ST., CHICAGO, ILL.

**ANNOUNCEMENT.****Western Electric Manufacturing Company.**

GEO. H. BLISS having acquired an interest with this Company, has been appointed its General Agent.

His attention will be given to the sale of the Instruments and Goods of our manufacture and in which we deal.

In addition to our former line we have added the various specialties heretofore controlled by Geo. H. Bliss & Co.

With our ample facilities we hope to give to customers and the trade increased satisfaction in prices, quality and variety of our goods.

We invite correspondence and solicit patronage.

Western Electric Manufacturing Co.,

220 KINZIE ST., Chicago, Ill.

April 15th, 1875.

**WESTERN ELECTRIC MANUFACT'G CO.,**

SOLE AGENTS,

**ORTON'S PATENT AWL CLIP.**

These Clips have been in practical use for three years, and are rapidly displacing all others.

They are designed for holding messages and every form of blanks.

For convenience, durability and economy they are unequalled.

Western Electric Manufacturing Co.,

230 KINZIE ST., Chicago, Ill.

**ORTON'S****Patent Security Message Hook**

The damage resulting from the loss of a single message is frequently sufficient to equip a line many times with this hook. Papers cannot be blown or carelessly crowded from it.

These Hooks were first introduced by Geo. H. Bliss & Co. Thousands of them are in use in telegraph offices, banks and counting rooms.

PRICE 30 CENTS EACH, OR \$3.00 PER DOZEN.

Liberal terms to the trade.

Western Electric Manufacturing Co.,

230 KINZIE ST., Chicago, Ill.

**CALLAUD BATTERY,**  
KEPT ON HAND,

AND  
Orders filled by  
W. MITCHELL McALLISTER,  
728 Chestnut Street, Philadelphia,

CHARLES WILLIAMS Jr.,  
109 Court St., BOSTON, MASS.

AND BY

**THE WESTERN ELECTRIC MANUF'G CO.,**  
Agents for the United States,  
220 Kinzie St., Chicago, Ill.

**LECLANCHE BATTERIES.****IMPORTANT NOTICE.**

After January 1st, 1875, we will allow 20 Cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

THE LECLANCHE BATTERY CO.,  
40 West 18th St.

Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
8 Dey St.

PHILADELPHIA: 54 South Fourth Street.  
CINCINNATI: 22 West Fourth Street.

**The "Snapper" Sounder.**

PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

**PRICE 75 CENTS.**

Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

**Patent Security Message Hook.**

The damage from the loss of a single message will equip a line many times with our new Hook, which gives great security.

Price 30 cents each.

Price per dozen \$3.00.

LIBERAL TERMS TO THE TRADE.

GEO. H. BLISS & CO.,  
220 KINZIE STREET, CHICAGO, ILL.,  
GENERAL AGENTS.



SENT ON RECEIPT OF PRICE.

26 & 27 Waring Block, Cleveland, O.

**AMERICAN LINE.**

Weekly Mail Steamship service between  
PHILADELPHIA AND LIVERPOOL,  
CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from  
Philadelphia.

ILLINOIS,	June 10.	INDIANA,	July 1.
*KENILWORTH,	June 17.	*ABBOTSFORD,	July 8.
PENNSYLVANIA,	June 24.	OHIO,	July 15.

PRICES OF PASSAGE IN CURRENCY.

Cabin, \$100.

Steerage and Intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate.

Passenger accommodations for all classes unsurpassed.

For passage, rates of freight and other information apply to

GEO. W. COLTON, Agent, 42 Broad Street, N. Y.

JOHN McDONALD, Passenger Agent, 8 Battery

Place, N. Y.

PETER WRIGHT & SONS, General Agents,

307 Walnut Street, Philadelphia.

Richardson, Spence & Co., N. & J. Cummins & Bros.,

Liverpool. Queenstown.

**Red Star Line.**

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.	From New York.
NEDERLAND,	June 14.
VADERLAND,	July 8.
	SWITZERLAND,
	June 28.
	July 20.

FROM ANTWERP.

For Philadelphia.	For New York.
VADERLAND,	June 14.
NEDERLAND,	July 8.
	SWITZERLAND,
	June 28.
	July 20.

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - \$90. Second Cabin, - \$60.

Steerage tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed.

For passage, rates of freight, and other information, apply to

GEO. W. COLTON, Agent, 42 Broad Street, N. Y.

JOHN McDONALD, Passenger Agent, 8 Battery

Place, N. Y.

PETER WRIGHT & SONS, Gen'l Ag'ts,

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This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

**AUTOMATIC PLAN,**is now in operation in the following cities, to which reference is made for evidence of its great **SUPERIORITY, VALUE** and **UNIFORM RELIABILITY**:

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Buffalo, N. Y.,	Omaha, Neb.,
Baltimore, Md.,	Philadelphia, Pa.,
Chicago, Ill.,	Pittsburg, Pa.,
Cincinnati, Ohio,	Portland, Me.,
Columbus, Ohio,	Peoria, Ill.,
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Covington, Ky.,	Rochester, N. Y.,
Detroit, Mich.,	Richmond, Va.,
Dayton, Ohio,	Indianapolis, Ind.,
Elizabeth, N. J.,	St. Louis, Mo.,
Fall River, Mass.,	St. John, N. B.,
Fitchburg, Mass.,	Springfield, Mass.,
Hartford, Conn.,	San Francisco, Cal.,
Jersey City, N. J.,	Savannah, Ga.,
Louisville, Ky.,	Syracuse, N. Y.,
Lawrence, Mass.,	Troy, N. Y.,
Mobile, Ala.,	Toledo, Ohio,
Montreal, Canada,	Toronto, Canada,
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The distinctive features of these systems of  
**FIRE ALARM AND POLICE TELEGRAPHS**

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*First*—The **AUTOMATIC SIGNAL BOXES**, the simple electro-mechanism of which enables any one—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The **AUTOMATIC REPEATER**, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without the constant personal attention of either operators or watchmen.

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*These features combined form the*

**ONLY PERFECT, COMPLETE, AND RELIABLE SYSTEM**

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The introduction and operation of the  
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A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy upon application as above.

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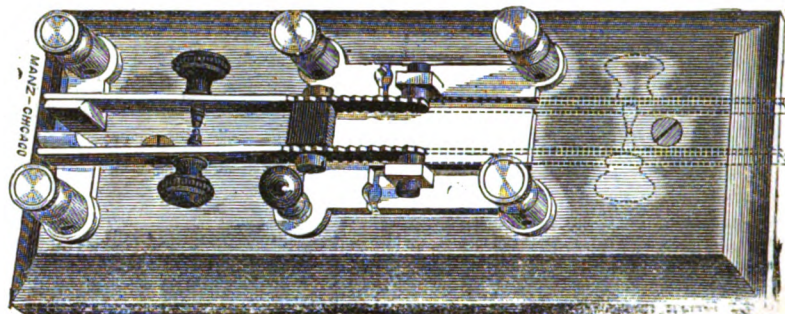
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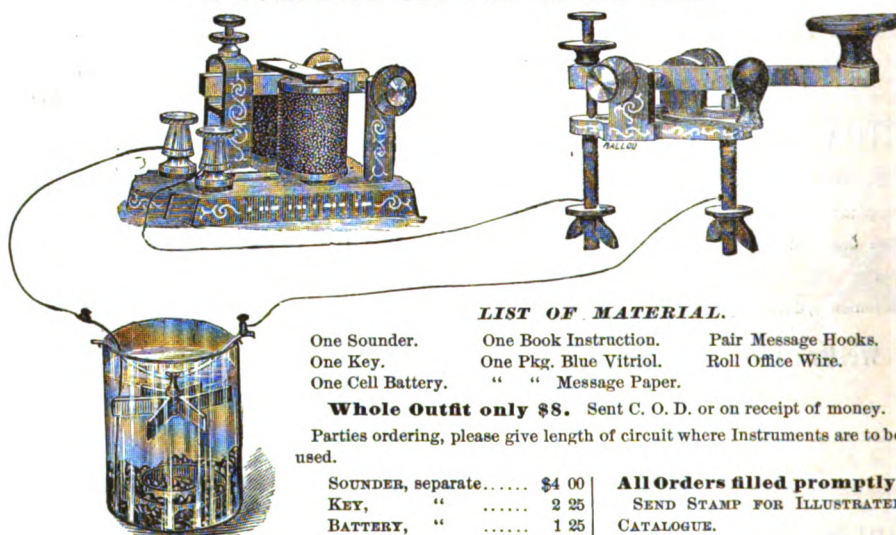
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One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
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**LOW RESISTANCE, EASY ADJUSTMENT AND  
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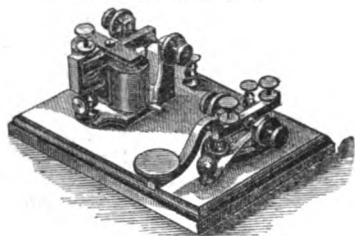
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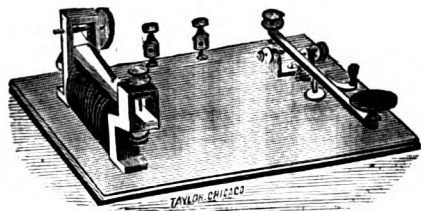
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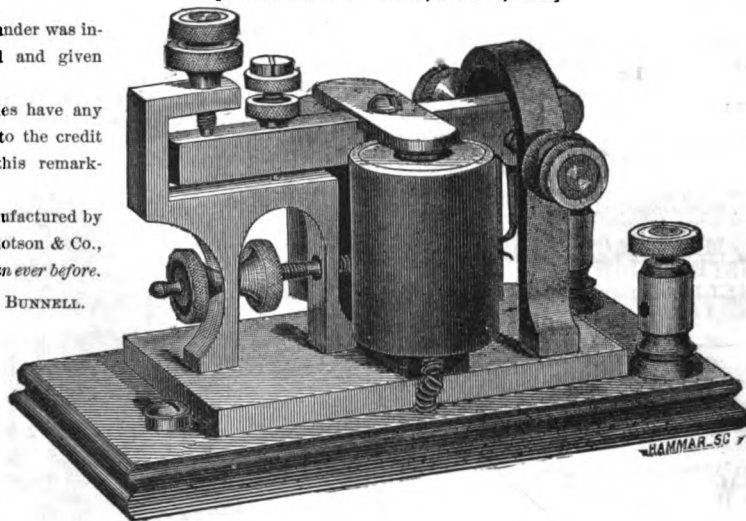
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The Giant Sounder was in-  
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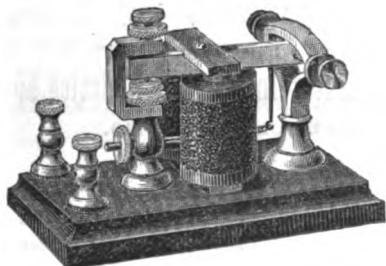
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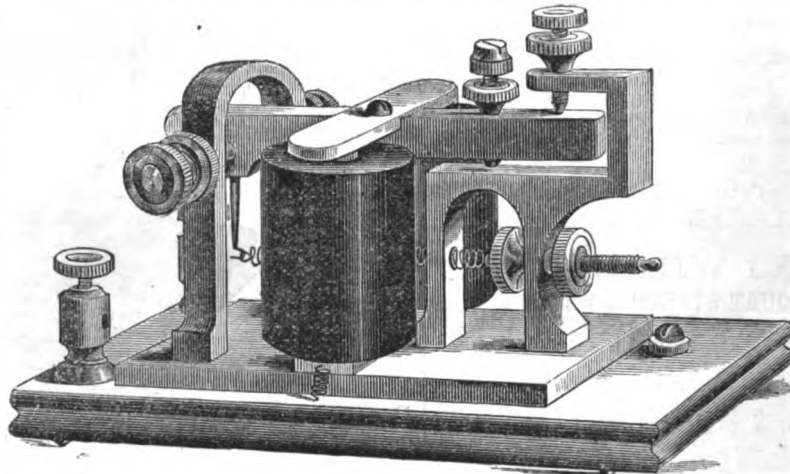
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The only Manufacturers of the Original

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**BEWARE OF WORTHLESS IMITATIONS.**



**MANUFACTURERS OF  
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The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. **Every instrument warranted perfect.**

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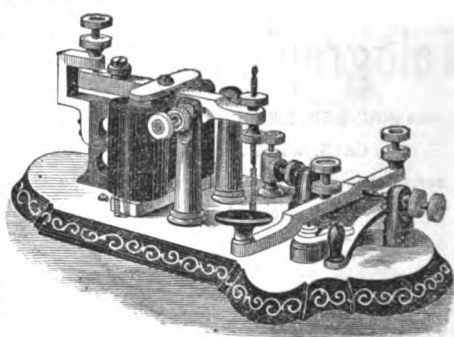
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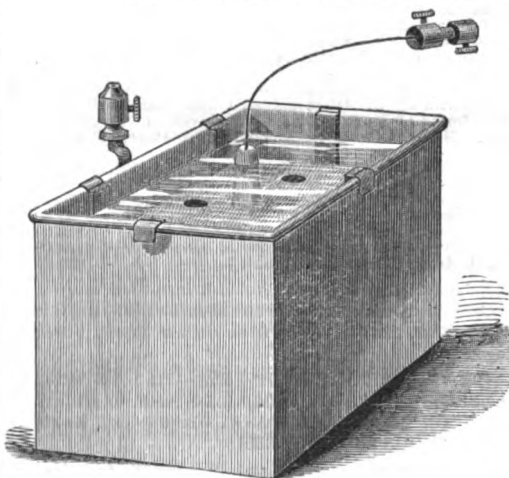
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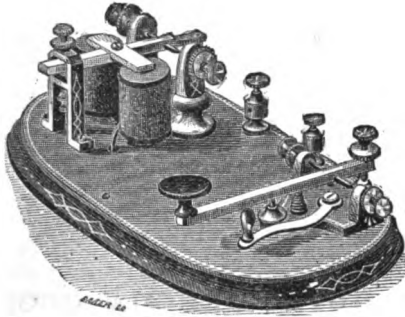


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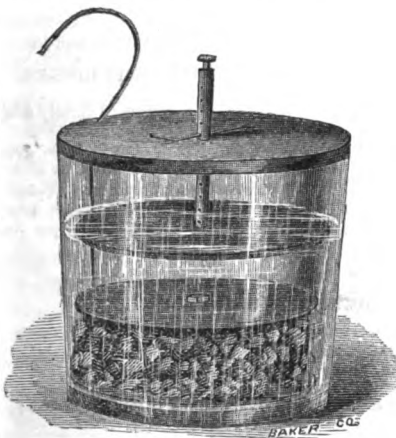
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## Private Line Instrument

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on a line from a few feet to ten miles in length.

BLISS'  
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This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

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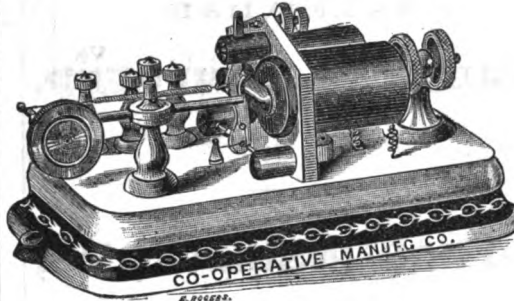
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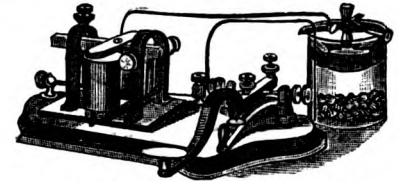
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They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.



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As fine works as watch; stem-winder; 36 hours; Belgian make. "Most scientific mechanical achievement, and cheapest daily monitor ever devised by man." It is as loud as a Pony Sounder. A perfect ALARM clock. P. O. order costs five cents. Sent with full directions, post-paid. Price \$4.25, or C. O. D. by express. You examine before payment.

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PATENT PENCIL HOLDER.

This Holder is intended to save the last half or third of the pencil.

## DIRECTIONS

When pencil becomes too short to write with comfortably, shave down the butt and screw into the holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price.

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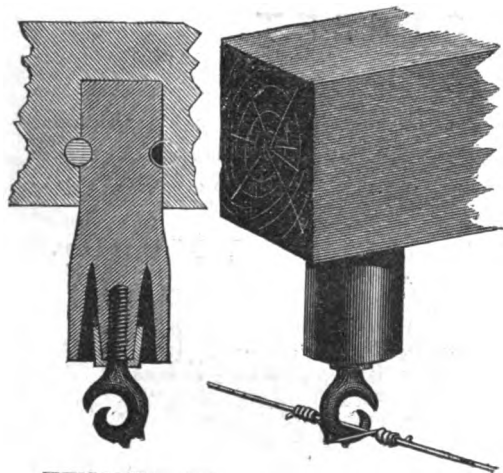
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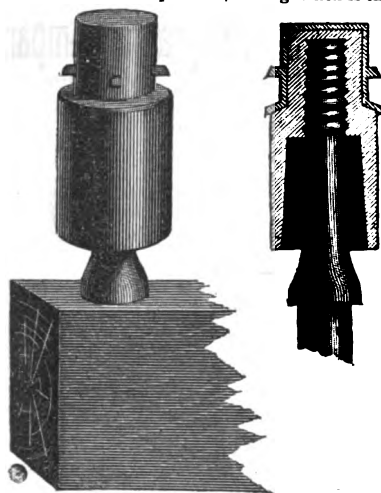
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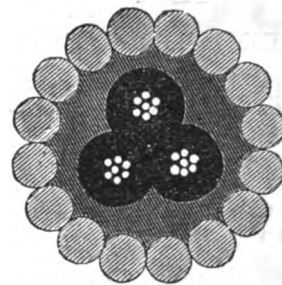
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# JOURNAL OF THE TELEGRAPH.

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WHOLE NO. 184.

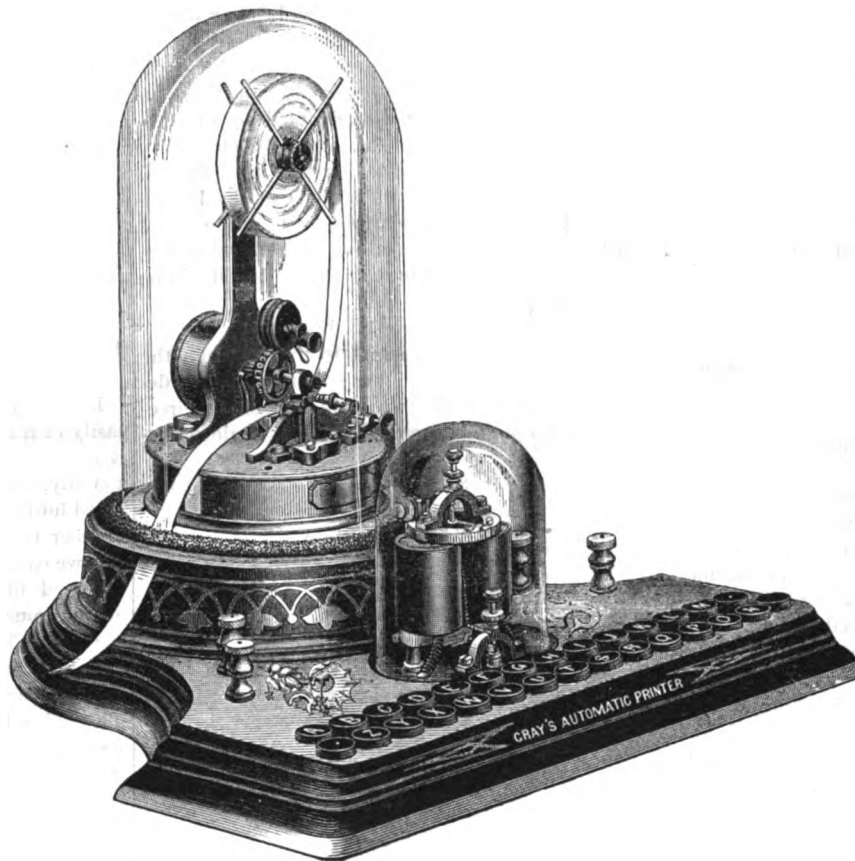
## THE GOLD AND STOCK TELEGRAPH COMPANY'S PRIVATE LINE SYSTEM.

### GRAY'S PRINTING INSTRUMENT.

Among the numerous modern applications of the Electric Telegraph which have attained such an extraordinary growth and development within the past few years, one of the most important consists in the establishment of private lines connecting two or more places of business; the offices of merchants and manufacturers with their residences, warehouses and factories; and to fulfill other requirements of this nature, which readily suggest themselves. Probably the first line of this description built in this country was constructed for Col. R. M. Hoe, the celebrated inventor of the cylinder printing press, who built a line in 1849 from his office in Gold street to his manufactory in Sheriff street, in this city, a distance of about two miles, and equipped it with the ordinary Morse registers. The necessity of employing a special skilled operator was, for many years, a great drawback to the general introduction of private lines, and even after alphabetical dial instruments became available, but comparatively few such lines were erected. The business—what there was of it—fell into the hands of irresponsible parties, who, when they had secured a contract for a line, erected one of the cheapest and most inferior character, which answered the purpose if it held together long enough to enable the builder to get his money for it and depart. There were, of course, some honorable exceptions to this rule, but it was not until within a comparatively recent period that anything worthy of the name of a complete system was established.

In 1871 the Gold and Stock Telegraph Company of this city, having previously established an extensive system of lines and instruments for reporting the quotations of the gold and stock exchanges, decided to add a regular private-line department to their rapidly increasing business. The Company accordingly made arrangements to purchase or control all the most valuable patents for printing instruments adapted to this purpose, other than those already owned by it. They then proceeded to construct pole lines of the most substantial, durable and costly character through the principal business portions not only of New York, but the adjoining cities and suburbs of Long Island and New Jersey, the

latter being brought into connection by a large number of submarine cables. The plan of operations adopted by this Company was that of erecting a sufficient number of lines to meet the probable requirements of the business, which could then be made available to connect any required points within the range of the Company's field of operations. By this means they were enabled to furnish at short notice, to parties desiring it, a complete telegraph line, equipped with type-printing instruments, batteries and other necessary requirements, and by means of a trained corps of skillful and efficient employes to assume the entire charge of it for a very moderate annual rental. That this policy was an eminently



sagacious one has been sufficiently attested by the subsequent rapid development of the system.

The necessity of providing for use upon this class of lines a printing telegraph instrument of easy and simple manipulation, requiring no scientific or mechanical knowledge, nor previous experience on the part of the person operating it, was early recognized by the officers of the Company, and has led them to extend the most liberal encouragement to all inventions and improvements in that direction. The result of this wise policy has been that a number of instruments and methods of great value have been developed and perfected, and afterwards, through the agency of the Company, extensively introduced into practical use.

One of the best of these instruments for private lines, and one which is now more extensively used than any other throughout the United States, is Gray's Automatic Printer, of which we present a fine illustration. The limited space at our command will not permit of our giving in the present article, a description of another instrument of this kind, which is also being largely introduced, known as Edison's Engine Printer, but we shall probably be able to do so in a future number.

As will be seen by reference to the illustration, the mechanism of Gray's apparatus is mounted upon a handsomely ornamented iron base, the working parts being protected from dust by glass shades. The key-

board extends across the front of the base, and consists of twenty-eight keys, upon which are engraved the different letters of the alphabet, with the necessary punctuation points, etc. The blank key at the extreme right is used to start the instrument. Beneath the small glass shade at the rear of the key-board is an upright polarized relay, behind and above which is situated the type-wheel and printing apparatus.

The communications are printed as received upon a continuous strip of paper which is fed from the roll above. The type-wheel is made to revolve by means of a double acting pallet escapement, attached to an armature which vibrates between the poles of two local magnets within the hollow base of the instrument. At the back of the instrument, directly in the rear of the type wheel, is a cylindrical brass case containing what is called the "sunflower." This is a flat annular disc of platinum, divided radially into equal segments corresponding in number to the transmitting keys, each of these segments being connected

to its corresponding key by an insulated wire. A circuit-closing arm, rigidly attached to the type-wheel shaft, travels over the divided disc as the shaft revolves, and places the latter in electrical connection successively with each segment. The same circuit (which is that of the main line) is conducted through the coils of the polarized relay, and this, by means of a local circuit, controls the escapement magnets above alluded to.

The general principle upon which the instrument acts may now be understood without difficulty, although the details would require special drawings to render their description sufficiently clear. Upon breaking the main circuit, by depressing the extreme right-hand key, the relay moves and the local magnets



release the escapement, which in turn allows the type-wheel to move forward a step, carrying with it the moving arm upon the sunflower. By means of a pole-changer attached to one instrument only in each circuit, the direction of the line current is reversed for each letter passed over, and thus the polarized relay and escapement magnets continue to vibrate automatically until the sender depresses some other key. The depression of this key breaks the circuit leading to the corresponding segment of the sunflower, and when the traveling arm reaches this segment the main circuit is interrupted, the escapement cannot act, and the type-wheels of both instruments come to a stand. The letter or character upon the type-wheel corresponding to the key which has been depressed upon the sending instrument being thus brought opposite the paper strip, the impression is effected by a magnet in the local circuit, which is instantly brought into action upon the cessation of the vibrations of the relay armature.

Thus it will be seen that any person who can read and spell can transmit communications upon this instrument merely by fingering the appropriate keys, and that these may be automatically recorded, even in the absence of an attendant, at one or more distant points.

This instrument is a comparatively recent invention, having been first introduced so lately as the autumn of 1871, since which time nearly a thousand have been manufactured and set in operation. The ordinary speed of transmission attained by persons who have become familiar with the positions of the letters upon the key-board is usually from 14 to 16 words per minute. The apparatus is very simple and in practice is not found to be liable to disarrangement. It can be worked on lines of any required length.

#### THE SINE GALVANOMETER.

The principle upon which the sine galvanometer is constructed is illustrated in the diagram Fig. 1. The line  $s n$  represents a magnetic needle at rest in the meridian. If the needle is deflected through the angle  $\alpha$ , by the influence of a galvanic current  $a b$  flowing in the same plane, then the line  $n' M$ , drawn parallel to  $s n$ , will represent the direction of the earth's magnetic force, which constantly tends to bring the needle back to its position in the meridian. The intensity of this force is represented by the length of the line  $n' M$ , and is denoted by  $M$ .

In order to ascertain what portion of this force acts upon the needle, we may resolve  $n' M$  into two forces, viz.:  $n' f$  acting in a direction at right angles to the needle, and  $n' g$  in a direction parallel to it. The latter, however, is entirely exerted upon the fixed turning point. Therefore  $n' f$ , represents the actual force of that portion of the earth's magnetism which tends to bring the needle back to the meridian  $s n$ . Therefore we have

$$n' f = n' M \sin \alpha = M \sin \alpha.$$

Thus the force of the earth's magnetism, which tends to bring a deflected needle back to its state of rest in the meridian, is always equal to  $M \sin \alpha$ , in which  $M$  remains constant, so long as the needle remains at the same point on the earth's surface, and retains its original magnetism.

The coil of the sine galvanometer must first be placed parallel with the magnetic meridian. When the needle is deflected by the passage of the current through the coil, the latter is turned after the needle until it coincides with its new direction. To illustrate this, let  $s n$ , Fig. 1

represent the needle at rest in the meridian, and  $a b$  the galvanometer coil parallel thereto. Now suppose that the passage of the current deflects the needle and causes it to assume the position indicated by the dotted line, and that the coil  $a b$  is then turned in the same direction, until it also coincides in direc-

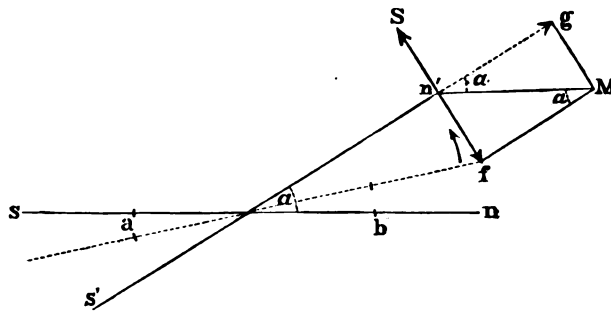


Figure 1.

tion with the dotted line; the needle will be deflected still further in the direction of the arrow, because the tendency of the current is always to bring the needle into a position at right angles to its own course; but this is constantly opposed by the directive force of the earth's magnetism, tending to carry it back to the meridian. By continuing the movement of the coil in this direction, a point is at length reached at which the coil and the needle are again parallel, which is represented by the line  $s' n'$ . The influence of the galvanic current upon the needle is still exerted, as before, in a direction at right angles to the conducting wire, denoted by the line  $n' S$ , while that portion of the earth's directive force which acts upon the needle, is represented by  $n' f$ . The needle being at rest under the combined influence of these two forces, it follows that the forces must be equal to each other. The force  $n' S$  is, therefore, exactly equal to  $n' f$ . But  $n' f = M \sin \alpha$ ; consequently,

$$n' S \text{ or } S = M \sin \alpha.$$

If we allow another current to pass through the same coil, and again turn the coil towards the deflected needle until the two again coincide in direction, and denote this current by  $S'$ , the angle of deflection by  $\alpha'$ ,

$$S' = M \sin \alpha';$$

and for both currents,

$$S : S' = \sin \alpha : \sin \alpha',$$

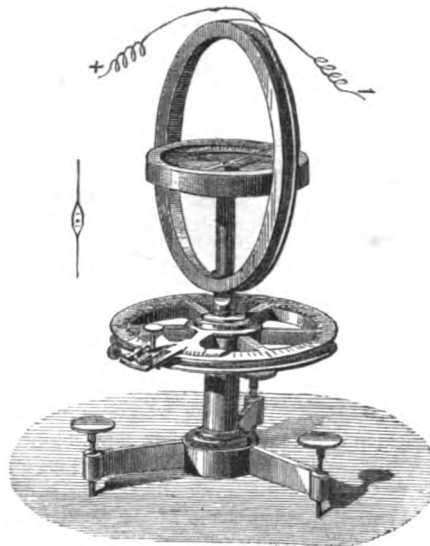


Figure 2.

That is to say, the magnetic forces of two galvanic currents are to each other as the sines of the angles of deflection of the needle, in cases when the gal-

vanometer coil has been turned after the needle, until the direction of the two is coincident.

The sine galvanometer is founded upon these laws. Its essential parts will be easily understood by reference to Fig. 2. In the center of the divided horizontal ring is placed the magnetic needle, while the vertical ring contains the conducting wire. The whole is so arranged as to be capable of being turned around its vertical axis, and the angle through which it is turned may be read off from the graduated horizontal circle below.

When using the instrument, the index on the lower graduated circle is placed at zero, and then the coil is turned until it stands in magnetic meridian, so that the needle points to the zero of the upper graduated circle. If we now allow the current which is to be tested, to pass through the coil, the needle is deflected. The vertical ring, which con-

tains the conducting wire, is now turned in the direction of the deviation of the needle, until the two are brought into the same vertical plane, and the needle again points to zero, as the upper divided circle has kept company with the coil in turning. The deflection of the needle is then read off from the lower circle, and the sine of the angle of deflection is the measure of the strength of the current.

When the sine galvanometer is used for measuring weak currents, the convolutions of the conducting wire should be as numerous and as close as possible to the needle.

As the sine galvanometer, when properly arranged, is more expensive and not so convenient for general use as the more simple tangent galvanometer, it is but little used except for scientific experiments, especially in cases where the currents which are to be measured are not strong enough to act upon the needle of the tangent galvanometer with sufficient power.

#### THE MULTIPLIER ARRANGED AS A SINE GALVANOMETER.

It is obvious that the ordinary multiplier may easily be transformed into a sine galvanometer, when it is so arranged that the coils may be turned horizontally, independently of the needle, and a graduated horizontal circle so arranged as to indicate the number of degrees traversed upon a fixed index. But we can, with equal convenience, when there is no fixed index or graduated circle, indicate the angle through which the coil is turned by means of the multiplier, if, after the current has been made to pass through the coil, we turn the latter after the deflected needle, until they coincide and the multiplier wire becomes parallel to the needle. If we now interrupt the current, the needle returns to its state of rest, and describes exactly the angle which the coil has traversed in its removal from its original position in the magnetic meridian.

If it is not practicable to turn the coil itself, we may still use the multiplier as a sine galvanometer, by placing it upon a horizontal disc, capable of being turned around a vertical axis, and provided with a graduated scale. This, of course, is managed in the same way as a sine galvanometer.

In using this instrument, care should be taken to ascertain that after a current has been measured that the needle still retains its original magnetism. This may be very easily done by observing whether the needle, after the current has been broken, returns completely to its former position of rest, the zero point of the scale.

Siemens & Halske's sine tangent galvanometer

(Fig. 3), is an instrument which may be used both as a sine and a tangent galvanometer. The annular horizontal plate P, upon which the wire ring R and the needle-box M are fixed, may be turned by two insulated handles *u* in the plate P, of which only one is visible in the drawing.

Upon the circle Q is a graduated scale T and upon the movable ring P is an index mark *i*. By means of this graduated scale T the angles are read off in the manner heretofore described when the galvanometer is to be used by the sine method. Within the needle-box is also another graduated scale T, by means of which the angles are read off, when the current is to be measured by the tangent of the angle of deflection.

The coil R consists of 16 convolutions of wire  $\frac{1}{8}$ th inch thick, which proceed from screw *k*<sup>I</sup> to screw *k*<sup>II</sup>, and of 1050 convolutions of thin wire ( $\frac{1}{16}$ th of an inch), which pass from screw *k*<sup>III</sup> to *k*<sup>IV</sup>. The thicker coil has a resistance of less than 0.1 Siemens units (which will be hereafter explained), while the resistance of the thinner coil is about 150 Siemens units.

When screws *k*<sup>I</sup> and *k*<sup>II</sup> are connected with the poles of a battery, then the thick wire coil alone is connected; but when *k*<sup>III</sup> (not visible in the drawing) and *k*<sup>IV</sup> are connected with the poles of a battery the thin wire coil only is in circuit. By pulling out the knob *u* two stops are caused to project in the needle-box M, so that the swing of the needle is confined between narrower limits.

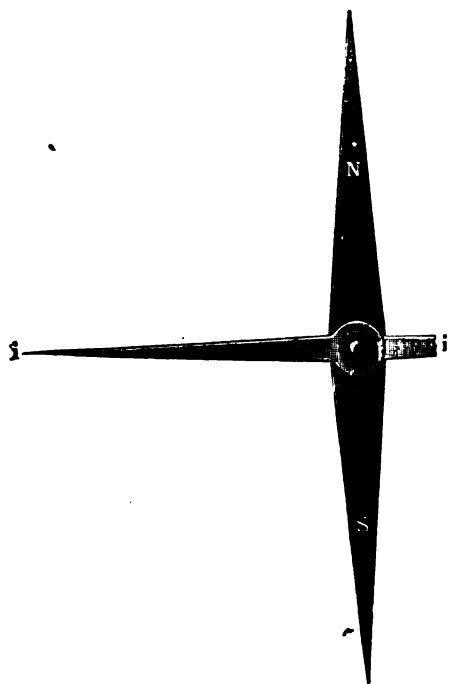


Figure 4.

Fig. 4 represents the sine needle, and is of full size. The pointer *i* is of aluminium.

Fig. 5 represents the tangent needle, of full size. The pointer *i* is also made of aluminium.

When the currents are of such force that it is impossible to read off the angles with accuracy, a portion only of the current is allowed to pass through the

instrument. This is accomplished by inserting an additional wire between the corresponding screws of the instrument, the resistance of the wire being in a known proportion to that of the coil of the instrument. The theory of resistances and branch currents will be considered hereafter, but for the

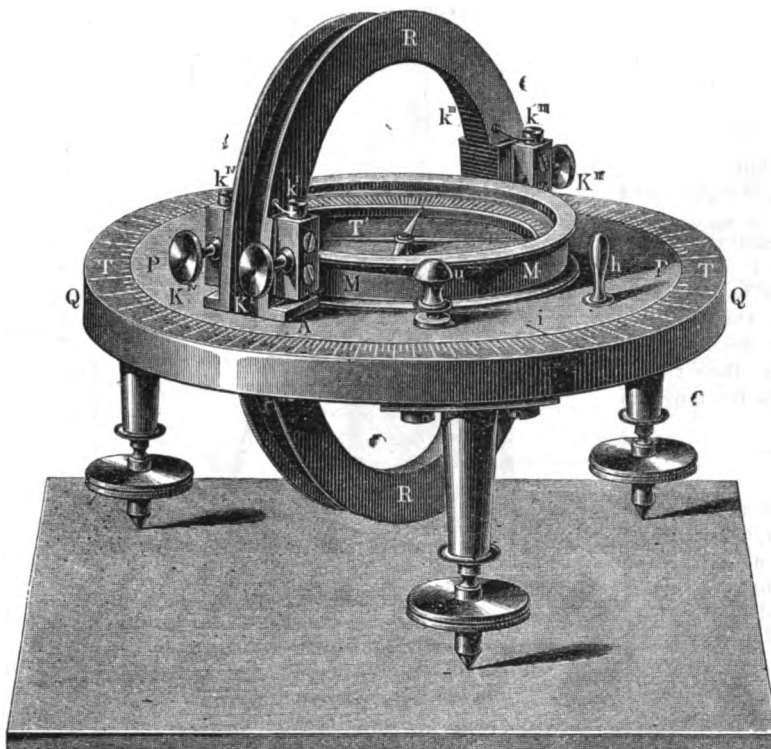


Figure 3.

sake of completeness we will refer also to its use with the sine-tangent galvanometer for the benefit of such persons as are already familiar with the principle.

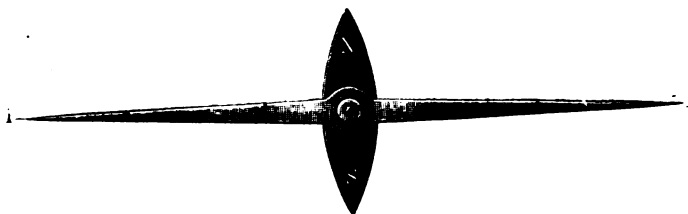


Figure 5.

Referring to Fig. 6, suppose *w* to be this branch wire, while *W* represents the resistance of the instrument, *E* the battery, and *S*' the current passing through the galvanometer with the branch circuit

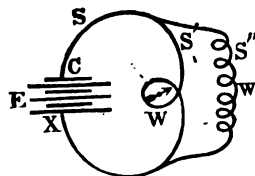


Figure 6.

open, *S*' the current through the branch circuit only; then, if *S* represents the entire strength of the current of the battery in the portions of the circuit outside the galvanometer, we have:

$$S = S' + S''$$

$$S' : S'' = w : W$$

Hence,

$$S = \frac{W + w}{w} S'$$

If we substitute in succession for *w* the values  $\frac{1}{2}W$ ,  $\frac{1}{4}W$  and  $W$ , we obtain:

$$S = 10 S'$$

$$S = 5 S'$$

$$S = 2 S'$$

A branch wire, thus arranged to convey a portion of the current around the instrument, is termed a *shunt*. Fig. 7 represents a box or case containing three such shunts or branch wires, the respective resistances of these wires being in the proportion above stated. The binding screw marked 0 forms the common terminal of the three shunts, while the resistances of  $\frac{1}{2}W$ ,  $\frac{1}{4}W$  and  $W$ , proceeding therefrom, terminate respectively in the screws

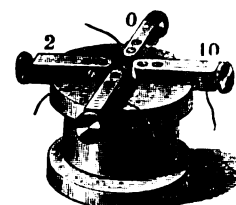


Figure 7.

marked 10, 5 and 2, as illustrated in Fig. 8. If, therefore, we connect 0 with one of the binding screws of the sine-tangent galvanometer (Fig. 3), and either 10, 5 or 2 with the other binding screw, the branch circuit or shunt thus connected will divert a portion of the current, and the remainder which still passes through the instrument, will be only  $\frac{1}{10}$ ,  $\frac{1}{5}$  or  $\frac{1}{2}$

the original amount, as the case may be; therefore, in order to obtain the true value of the strength of the current, we should multiply sine or tangent of the observed angle respectively by 10, 5, or 2. In this manner, by the aid of shunts, it is quite possible to make use of very sensitive instruments to measure powerful currents. The combined sine-tangent galvanometer is very well adapted for telegraphic purposes, all the measurements which were required in laying the Red Sea cable having been made with one of these instruments.

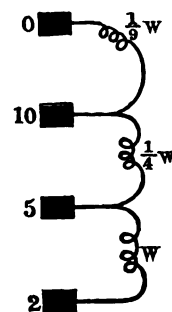


Figure 8.

#### PRECAUTIONS NECESSARY IN USING GALVANOMETERS.

Great care should be taken, when using any galvanometer, not to allow too powerful currents to pass around the needle, as such currents are liable either to change the magnetic intensity of the needle or to reverse its polarity altogether. Hence, in order to avoid the injurious influences upon the magnetism of the needle even of feeble currents, the currents

should not be allowed to act upon a galvanometer for a longer time than is necessary.

When using the tangent galvanometer, it must be remembered that the trigonometrical tangents of the angles  $0^\circ$  to  $45^\circ$  of a circle whose radius is 1, increase from 0 to 1, but that, on the contrary, for angles of  $45^\circ$  to  $90^\circ$  the tangents increase from 1 to  $\infty$  (infinity). It follows, therefore, that at large angles, a very considerable change in the strength of the currents will produce but a slight change in the angle of deflection, and that, even in a very accurately constructed instrument, an increase in the angle of deflection is hardly perceptible; or rather is quite imperceptible, although the current-strength may have been considerably increased.

The case is similar with the sine-galvanometer. The difference in the sines between  $1^\circ$  and  $10^\circ$  is very much larger than the difference in the sines between  $81^\circ$  and  $90^\circ$ . For this reason the sine galvanometer is much more accurate in the measurement of large angles than smaller ones; the reverse being the case, as we have seen, with the tangent galvanometer.

#### THE VOLTA-METER.

Faraday has shown that the chemical action of a galvanic circuit is equivalent to its magnetic action, and that the quantity of water decomposed in a certain time by a current, or, what is the same thing, the volume of inflammable gas evolved during that time is in proportion to the strength of the current.

If, therefore, we take an apparatus for decomposing water, which is provided with a graduated glass tube for the purpose of retaining and measuring the inflammable gas formed by the decomposition of the water, we have an instrument termed the Voltameter, which may be employed for the purpose of comparing the strengths of different currents with each other.

Figures 9 and 10 show the construction of the Voltameter.

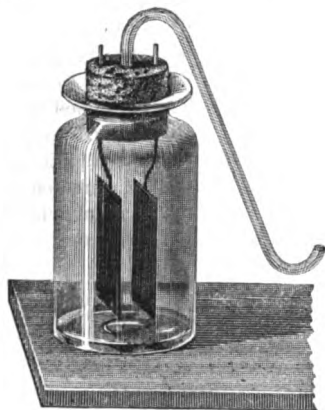


Figure 9.

The glass vessel is filled with dilute sulphuric acid, or preferably with pure sulphuric acid of 1.3 specific gravity. Through glass tubes inserted in the leaden plug which closes the vessel at the top pass two insulated copper wires, hermetically sealed, into the vessel, where they are soldered to two thin platinum plates, which stand opposite to each other and as near together as possible. The copper wires in the inside of the vessel are protected from the action of the acid by a coating of varnish. If we connect the ends of the copper wires protruding from the leaden plug with the poles of a battery, then the current passes from one platinum plate to the other, through the acidulated water, which is thereby decomposed, forming inflammable gas. The latter ascends and escapes through the bent tube. In order to measure

it we confine it in a glass tube, divided in cubic centimeters, as represented in Fig. 11. If we wish to measure this with accuracy, and have the inflammable gas perfectly pure, the compound gas that is separated from the water should be made to pass through sulphuric acid, in order to remove any water which it might contain.

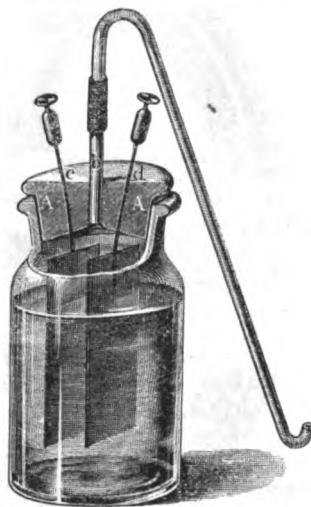


Figure 10.

Nevertheless, it must not be forgotten that the insertion of a voltameter into the circuit of a battery, on account of the great resistance which it opposes to the passing of the electricity, materially reduces the strength of the galvanic current.

#### REDUCTION OF THE VOLUME OF GAS.

The use of the voltameter requires an exact measurement of the volume of inflammable gas formed by the current in a given time. The volume of a confined gas, however, according to Mariotte's laws, depends on the pressure brought to bear on it, the volume decreasing in the same proportion that the outside pressure increases. Besides this, the temperature has an important influence upon the volume of a confined gas. With respect to the latter circumstance the careful investigations of physicists have shown that all gases are subject to the same amount of expansion for like changes of temperature, and that for each degree over or be-

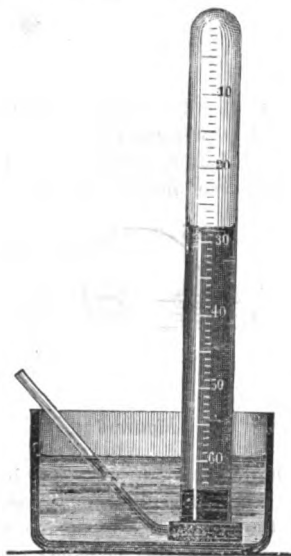


Figure 11.

low  $0^\circ$  Centigrade, the change in volume of the gases amounts to about  $\frac{1}{273}$  of their volume at  $0^\circ$ , or  $32^\circ$  Fahrenheit.

In measuring a certain volume of gas, it should

therefore always be stated at what temperature and under what pressure the measurement has been made, and when several different volumes are to be compared the measurements ought either to be made at the same temperature and under the same pressure, or, as this often is not practicable, the results must be reduced by calculation, so as to render them comparable with each other.

It has therefore been agreed upon, in making these reductions, to adopt the temperature  $0^\circ$  C. and the barometrical pressure of 760 millimetres (30 inches) of mercury. If, therefore, we have measured the volume of inflammable gas originating from the decomposition of water at a temperature of  $t^\circ$  and a pressure of  $b$  millimetres, then we must by calculation find what the volume would have been at a temperature of  $0^\circ$  C. and barometrical pressure of 760 millimetres.

The quantities of inflammable gas obtained under the same conditions, the temperature and pressure being the same, by means of galvanic currents in the same length of time, are in proportion to the strengths of currents themselves.

In order to make the necessary corrections, we must first ascertain what the volume of gas would have been, measured at the temperature of  $t^\circ$  and a pressure of  $b$  mm., in case the pressure had been 760 mm. and the temperature  $0^\circ$ . Let us call the volume of gas measured at  $t^\circ$ ,  $V$ , and the volume of gas at  $0^\circ$ ,  $v_0$ , then for each degree of temperature the gas expands about  $\frac{1}{273}$  part of the volume which it occupies at  $0^\circ$ ; hence, for  $t^\circ$  the gas expands about  $\frac{t}{273}$  part of its original volume at  $0^\circ$ ; therefore volume  $v_0$  for  $t^\circ$  temperature increase ex-

pands about  $\frac{t}{273} \times v_0 = \frac{tv_0}{273}$ ; the true volume at  $t^\circ$

$$V = v_0 + \frac{tv_0}{273} = \frac{273v_0 + tv_0}{273} = \frac{v_0(273 + t)}{273},$$

and therefore the volume at

$$0^\circ \text{ or } v_0 = \frac{273V}{273 + t}.$$

From the measured volume of gas  $V$  at  $b$  mm., we have, under the same pressure, volume  $v^\circ$  at the temperature  $0^\circ$ . If, however, instead of  $b$  mm., the pressure were, for instance, 760 millimetres, then, according to Mariotte's laws, if we denote volume corresponding to 760 millimetres pressure by  $x$ , we have

$$x : v_0 = b : 760,$$

and from this

$$x = v_0 \frac{b}{760}$$

If we substitute the previously known value of  $v_0$  in this equation, then we have

$$x = \frac{273 \cdot V \cdot b}{(273 + t) 760}$$

In order to make this formula more clear by a numerical illustration, let us suppose that a certain current has developed in the voltameter 30.8 cubic centimetres inflammable gas per minute, at a temperature  $15^\circ$  C., and a pressure of 740 millimetres. To reduce this volume to  $0^\circ$  C., and 760 millimetres, we have to substitute in the preceding formula

$$V = 30.8, b = 740, t = 15,$$

from which we have

$$x = \frac{273 \cdot 30.8 \cdot 740}{(273 + 15) 760} = 28.43 \text{ cubic centimetres,}$$

That is to say, the current would have developed 28.43 cubic centimeter inflammable gas in one minute, at a temperature of  $0^\circ$ , and a pressure of 760 millimetres.



## THE UNIT OF MEASUREMENT.

Measurement is simply the comparison of an unknown quantity with a known quantity of the same kind. In order, therefore, to measure the quantity of a galvanic current it becomes an absolute necessity to adopt a known current, whose intensity then forms a unit of comparison by which to measure other strengths of current.

Among the several methods proposed for measuring the strength of currents, the unit employed by Jacobi deserves the preference, on account of its simplicity and clearness.

According to Jacobi, the unit strength of current is that which in one minute evolves 1 cubic centimetre inflammable gas at a temperature of  $0^{\circ}$  C., and a pressure of 760 millimeters; consequently any current which gives in one minute a volume of  $a$  cubic centimeters inflammable gas its strength is  $a$ , because the quantity of water which the latter has decomposed is always proportional to the volume of the inflammable gas evolved.

## MEASUREMENT OF THE CURRENT STRENGTH BY MEANS OF THE VOLTAMETER.

In order to measure the strength of a galvanic current by means of a voltmeter, it is only necessary to insert the latter into the circuit and mark the time by the watch. When we have a sufficient quantity of gas, then we interrupt the current, note the time during which the circuit has been closed, and measure the volume of gas obtained. If the temperature was not  $0^{\circ}$  and the pressure not 760 millimeters, then the necessary corrections of the volume of gas should be made.

We easily find from the reduced volume, by dividing it by the number of minutes which have elapsed, how many cubic centimeters inflammable gas at  $0^{\circ}$  C. and 760 millimeters pressure the current has given per minute, and this number at the same time denotes that of the intensity of the current itself, that is to say, it indicates how many times stronger this current is than one which gives one cubic centimeter of gas of the same density per minute. Accordingly it follows that the strength of such a current, which gives in one minute 30.8 cubic centimeter of gas at  $15^{\circ}$  C. and 740 millimeters pressure, becomes, after reduction, 28.43.

Although the manipulation of the voltmeter is apparently very easy, it is nevertheless not always available to measure the strength of currents, because weak currents decompose the water so slowly, that it would require altogether too much time to obtain a measurable volume of gas, and the current during such a length of time would perceptibly change its strength. On the other hand, the liquid in the voltmeter opposes considerable resistance to the passage of the electricity and weakens the current. For this reason the quantity of gas obtained indicates the force of the current which has actually passed through the voltmeter, and would have not the strength which the current from the same source possessed, if it had not been made to pass through the voltmeter.

## MEASUREMENT OF THE STRENGTH OF CURRENT BY MEANS OF THE TANGENT OR SINE GALVANOMETER.

The resistance which the coil of the tangent galvanometer opposes to the passage of the current is so small in comparison to that of the voltmeter that it may almost always be included in the circuit without perceptibly diminishing the current. On the other hand, in these instruments, the indications of the needle depend upon the diameter of the coil, and therefore the same strengths of current on different instruments give different angles of deflection. The same instrument, when the strength of current is

the same, will also give unequal deflections of the needle at different places upon the earth's surface, because the intensity of the magnetic power of the earth, (the horizontal component of which always tends to carry the needle back to the magnetic meridian), varies upon different parts of the globe. Nevertheless, it is easy, by carefully comparing the indications of the tangent galvanometer with a voltmeter, to ascertain their relative value.

In order to compare the indications of the tangent galvanometer with the results of the voltmeter, we must insert both a galvanometer and a voltmeter in the circuit of a battery of several elements, and observe both the angle of deflection of the needle and the number of cubic centimeters of inflammable gas which the voltmeter produces in one minute. Suppose this current has a strength of  $S$ , and produces in one minute  $a$  cubic centimeters of gas (at  $0^{\circ}$  C and 760 millimeters pressure), and produces upon the galvanometer an angle of deflection of  $\alpha^{\circ}$ ; now, we have another current of unknown strength  $x$ , which is to be measured, which gives upon the tangent galvanometer the deflection  $\varphi^{\circ}$ ; it is required to find how much inflammable gas would the same have produced in a minute.

In the first place the strength of the currents are in the same proportion as the tangents of the angles of deflection of the tangent galvanometer; hence, is

$$S : x = \text{tang. } \alpha : \text{tang. } \varphi.$$

Then the strength of the currents is likewise in proportion to the volumes of the inflammable gas formed in one minute; hence, also, when we compare  $S$  with the current unit

$$1 : S = 1 : a,$$

the multiplication of both proportions gives directly

$$1 : x = \text{tang. } \alpha : a \cdot \text{tang. } \varphi;$$

hence the strength of current will be

$$x = \left( \frac{a}{\text{tang. } \alpha} \right) \text{tang. } \varphi;$$

$a$  and  $\text{tang. } \alpha$ , however, are the two known values. If we indicate these quotients

$$\frac{a}{\text{tang. } \alpha},$$

(which evidently indicates the gas compound corresponding with tangent 1,) by  $z$ , then we get

$$x = z \cdot \text{tang. } \varphi;$$

that is to say, to make use of a tangent galvanometer for measuring currents, we must cause any convenient current to pass through the same, and at the same time through a voltmeter, and observe accurately the angle of deflection ( $\alpha$ ) and the quantity of inflammable gas ( $a$ ) reduced to  $0^{\circ}$  C. and 760 millimeters; divide the latter ( $a$ ) by the mathematical tangent of the angle ( $\text{tang. } \alpha$ ), then, once for all, we have in this quotient what is called the reduction factor or multiplier  $z$  of that particular galvanometer by which the tangents of the angle of deflection produced by any other current should be multiplied in order to ascertain the strength of this current expressed in Jacobi's units.

Another example will further illustrate this:

The galvanic current from four elements gave, upon a tangent galvanometer, an angle of deflection of  $\alpha = 18\frac{3}{4}^{\circ}$ , and in 3 minutes a volume of 78 cubic centimeters of inflammable gas. The temperature of the room was  $15^{\circ}$  C and the height of the barometer 740 millimeters. The gas was caught over water in the graduated tube (Fig. 11), and the surface of the water stood 10 centimeters higher inside the tube than outside. First of all, the volume of gas is to be reduced from 78 cubic centimeters to  $0^{\circ}$  C and 760 millimeters pressure. As 760 millimeters of mercury is equal to the pressure of  $13.5 \times 760 = 10260$  millimeters of water, so 10 centimeters

or 100 millimeters of water are equal to 7 millimeters of mercury. Hence the gas stood under a pressure of 740 mm. — 7 mm. — 733 mm. mercury. The same gas would, at  $0^{\circ}$  C and 760 millimeters, occupy a volume of

$$x = \frac{273 \cdot 78 \cdot 733}{(273 + 15) 760} = 71.3 \text{ cubic centimeters}$$

Hence, in one minute, the current evolved

$$\frac{71.3}{3} = 23.77$$

cubic centimeters of inflammable gas.

The tangent of  $18\frac{3}{4}^{\circ}$ , the angle of deflection, is equal to 0.3394, consequently the multiplier of the galvanometer

$$\frac{a}{\text{tang. } \alpha} = \frac{23.77}{0.3394} = 70.008 \text{ or full } 70.$$

We must now multiply by this figure the tangents of the angle of deflection in order to get at the strength of the current which causes the deflection. If, therefore, on this same galvanometer, at any time, a current gives an angle of deflection of  $27^{\circ}$ , then the strength of current will be

$$S = 70 \cdot \text{tang. } 27^{\circ} = 70 \cdot 0.5095 = 35.665,$$

that is to say, the latter is 35.665 times as great as that strength of current, which develops in one minute 1 cubic centimeter of inflammable gas. Such a current, therefore, would produce in one minute 35.665 cubic centimeters of inflammable gas in the voltmeter.

It must be understood that the reduction factor or multiplier of a tangent galvanometer must be ascertained with the utmost precision, and therefore should not be finally determined by a single experiment, but only after a series of experiments; the mean of the observations being taken as the true result.

If we wish to compare a tangent galvanometer whose reduction factor is yet unknown with another one whose factor is known, then we may pass any current at the same time through both galvanometers, and note the angle of deflection upon each. If this be denoted by  $\alpha$  in the case of the known galvanometer, and its reduction factor be  $r$ , then we leave for this the strength of current

$$S = r \cdot \text{tang. } \alpha.$$

If the angle of deflection in the unknown galvanometer be  $\psi$ , and its unknown reduction factor  $x$ , then we have for this the same strength of current,

$$S = x \cdot \text{tang. } \psi.$$

Hence, also,

$$x \cdot \text{tang. } \psi = r \cdot \text{tang. } \alpha,$$

and

$$x = \frac{r \cdot \text{tang. } \alpha}{\text{tang. } \psi}$$

out of which immediately results the reduction factor of the unknown galvanometer.

It is evident now, from what has been said, that the reduction factor or multiplier of a tangent galvanometer only answers for that particular instrument for which it has been calculated; the change which it undergoes when the instrument is carried to some other place is exceedingly small, as the intensity of the magnetism of the earth differs very little in different places.

In order to make a sine-galvanometer applicable to measure the currents with the reading of a voltmeter, the same method above described is to be adopted.

THE average time occupied in the transmission of telegrams between Madrid and England, "via Santander," during May was three hours twenty-six minutes, including transmission over Spanish land lines.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Day street, New York, July 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

There is no office at East Lyme, Conn. Messages for that place are delivered by special messenger, or by stage which leaves Niantic once daily. Charge for delivery one dollar by messenger, or 25 cents by stage.

In computing the other line tariff on messages to Milton, Navy Yard, near Pensacola, Ferry Pass and Millvue, Fla., count and charge for three words more than the messages contain.

St. Augustine, Fla., reopened.

Waynesville, Ill., closed.

Augusta, Ind., closed.

The square for Fayette, Iowa, will, on and after July 5th, be 375 instead of 386.

Mercers, Ky., closed.

Messages taken for Crab Orchard Springs, Ky., are delivered from Crab Orchard; charges for delivery 25 cents.

Deer Park, Md., reopened.

Barrett's Junction, Mass., closed.

Hereafter the charge for delivery from Boston to Dorchester, Mass., will be 50 cents instead of 15 cents as at present.

In messages to Mexico, words such as La Prairie, St. Louis, New Orleans, San Juan and San Francisco, are counted as two words. East St. Louis, South New Market and East Des Moines are counted as three words.

Au Sable, Mich., closed.

Milton, Mich., changed to Chesterfield.

Oscoda, Mich., reopened.

Messages taken for the Michigan State Public School, near Coldwater, Mich., are delivered from the latter place. Charges for delivery, 30 cents.

Dardenne, Mo., changed to St. Peters.

Demarest, N. J., closed.

Martin's, N. Y., reopened.

Hereafter the "tariff for other lines" from Buffalo to points given below will be:

Franklinville, N. Y., 40 3.

Ischna, " 40 3.

Machias, " 40 3.

Portville, " 45 3.

Yorkshire Centre, " 40 3.

NEWFOUNDLAND.—Hereafter the date, address and signature of Newfoundland and St. Pierre M. I. messages will not be counted or charged for.

The tariff on prepaid or received collect Newfoundland and St. Pierre messages will be \$2.40 and 94 from W. Union offices in New England and New York City. Messages sent collect or received paid should be checked at rate of 75 and 5. The present mode of checking Newfoundland and St. Pierre business will remain unchanged.

All W. Union offices south and west of New England, except New York City, will add \$2.40 and 94 to their rate to New York on prepaid or received collect Newfoundland and St. Pierre messages. On messages sent collect or received paid the rate will be 75 and 5 added to the rate to New York. Check messages as heretofore.

Offices in the Eastern Division which have received recent notice of a change in the rate to Prince Edwards Island are hereby notified that no change to the offices on that Island was intended. The rate will be as formerly, viz: 60 and 4 from Sackville for offices west of N. B., and 50 and 8 from Sackville for offices east of Maine.

Messages taken for the Manhasset Hotel, Shelter Island, should be sent and checked to Greenport, L. I., N. Y.

Green Springs, O., closed.

Kansas, O., closed.

Collins Bay, Ont., reopened.

Courtland, Ont., closed.

Indiana, " closed.

The P. O. A. of Collinwood, O., for the present is Collamer. Hereafter the "tariff for other lines" from Buffalo, N. Y., to offices in Pa. here given will be as follows:

Eldred, Pa., 45 3.

Keating's Summit, McKean Co., Pa., 50 3.

Larabee's, " 40 3.

Port Allegany, " 50 3.

Morristown, Tenn., closed.

Elmo, Texas, closed.

Black River, Wis., changed to Hatfield.

Lowell, Wis., changed to Reeseville.  
Westport, Wis., changed to Mendota.  
Camp Stambaugh, Wy., closed.

## SUMMER OFFICES REOPENED.

29 Pequot House, New London, Conn.; check New London.  
\* Bar Harbor, Me.

17 Old Orchard Beach, Me.

21 Pigeon Cove, Mass.

17 Boar's Head, N. H.

17 Farragut House, N. H.

17 Sea View House, "

Messages for Hampton Beach and Rye Beach, N. H., should be sent and checked to Boar's Head and Farragut House, respectively.

47 Deal, N. J.

47 Ocean Grove, N. J.

40 Catskill Mountain House, N. Y.

46 Cozzen's Hotel, W. Point, N. Y.; check West Point.

\* Paul Smith's, N. Y.

\* Prospect House, Upper Saranac Lake, N. Y.

83 Watkin's Glen, N. Y.

169 Little Mountain, O.

\* Narragansett Pier, R. I.

\* Oakland Beach, R. I.

\* Rocky Point, "

143 Alleghany Springs, Va.

133 Blue Ridge Springs, Va.

103 Jordan's White Sulphur Springs, Va.

\* Orkney Springs, Va.

142 Rockbridge Alum Springs, Va.

142 Rockbridge Baths, Va.

143 Sweet Chalybeate Springs, Va.

69 Sewall's Point, Va.

143 Sweet Springs, W. Va.

27 Bethlehem, N. H.

27 Crawford House, N. H.

27 Fabyan House, "

27 Glen House, "

27 Mt. Washington, "

27 Mt. Washington Depot, N. H.

27 Profile House, "

27 Twin Mountain House, "

27 Waumbek House, "

Business with Mt. Washington will be checked to the Glen House; business with Mt. Washington Depot, check to Fabyan House. Tariff to above-named White Mountain, N. H., offices, in Square 27, is 20 cents more than the usual local, square and State rates.

## NEW OFFICES.

29 Niantic, Conn.

\* Green Cave Springs, Fla., 50 4 from Lake City.

\* Toccol, Fla., 50 4 from Lake City.

\* New Era, Ind., 25 2 from Fort Wayne.

\* Fort Sill, Ind. Terr., 25 1 from Denison, Texas.

375 Bayou des Allemands, La.

\* Tepic, Mexico, 650 60 from Brownsville, Texas.

200 Chesterfield, Mich. (formerly Milton).

270 Glenwood, Mich.

230 Pittabawassa, Mich.

\* Aurora, Minn., 100 7 from Chicago, Ill.

\* Good Thunder, Minn., 120 8 " " "

\* Mapleton, " 120 8 " " "

\* Minnesota Lake, " 120 8 " " "

369 St. Peters, Mo., (formerly Dardenne).

4 Morrison's Mills, N. B.

53 Sea Grove Hotel, Sea Grove Village, N. J. (Summer office).

Check Cape May City.

\* Angram, N. Y., 25 2 from Rondout.

120 Cherry Creek, N. Y.

46 Highland House, Garrisons, N. Y. Check Garrisons.

\* La Forgeville, N. Y., 25 1 from Utica, Mont. Co.

\* Red Hook, N. Y., 25 2 from Rondout.

83 Willseyville, N. Y.

\* Cobocok Town, Ont.

\* Port Cockburn, "

\* Selkirk, "

\* St. Eugene, "

\* Villa Nova, "

\* York, "

85 Gettysburg Springs, Pa. (Summer office). Check Gettysburg.

\* Laquerre, Que.

\* North Hatley, Que.

\* Tanneries West, Que.

\* Graham City, Texas, 25 1 from Denison.

\* Henrietta, " 25 1 " " "

\* Jacksboro, " 25 1 " " "

\* Pilot Point, " 25 1 " " "

\* Kaufman, Texas, 90 6 from Marshall.

75 5 " Dallas.

\* Purcellville, Va., 40 3 from Alexandria.

Mayhews, Wis.

\* Chelsea, Wis., 100 7 from Chicago, Ill.  
\* Forest Junction, Wis., 60 4 " " "  
\* Hatfield, Wis. (formerly Black River), 75 5 " " "  
\* Kaukauna, Wis., 60 4 " " "  
\* Mendota, Wis. (formerly Westport), 60 4 " " "  
\* Norwalk, Wis., 75 5 " " "  
\* Reeseville, Wis. (formerly Lowell), 50 3 " " "

## TO OFFICES HAVING "SHEET C."

Add the following offices in Wisconsin and Minnesota to your "Sheet C" and check them accordingly:

7 Forest Junction, Wis., 56 Good Thunder, Minn.,  
15 Kaukauna, Wis., 56 Mapleton, Minn.,  
29 Norwalk, Wis., 56 Minnesota Lake, Minn.,  
47 Aurora, Minn.,

Also the names of following places have been changed:

Black River, Wis., to Hatfield,  
Lowell, Wis., to Reeseville,  
Westport, Wis., to Mendota.

Government messages to and from Graham City, Henrietta, Jacksboro, Pilot Point, in Texas, and Fort Sill, Ind. Terr. (new offices on other lines), should be charged tariff for "this line" only. They are transmitted free beyond Denison.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, June 29th, 1875.

On Monday, July 5th, office hours will be from eight to ten o'clock, A. M. and from four to six o'clock, P. M., except at repeating stations and principal offices, which will be kept open as usual, with such reduction of force on duty as circumstances may permit.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE

EXECUTIVE OFFICE,  
NEW YORK, June 18, 1875.

On July 10th, Elkhart, Ind., and Hillsdale, Mich. will be discontinued as money-order offices.

On July 12th, Boulder, Colorado, will be added to the list of money-order offices in R. C. Clowry's district.

GEO. H. MUMFORD,  
Vice-Prest.

EXECUTIVE OFFICE,  
NEW YORK, June 28, 1875.

To all Transfer Agents:

Mr. G. W. Trabue, of Louisville, Ky., has been appointed Transfer Agent for the District heretofore in charge of J. B. Tree, dating from the 1st day of July next.

GEO. H. MUMFORD,  
Vice-President.

An official memorandum from the Great Northern Telegraph Company states that, according to information received from Foochow, an agreement was entered into and signed on the 21st May, between the Chinese Government, represented by the Imperial Commissioner Shen Panchen, Viceroy and General in the Province of Fookien, charged with full powers by Tsung-li-Yamen, Minister for Foreign Affairs in Peking, and the Great Northern Telegraph Company, to the following effect: "The Chinese Government pays the Company full compensation for the damage done to the Foochow-Amoy line in January last. The Company to erect a line of telegraphs between Foochow and Amoy for account and risk of the Chinese Government. Inland telegraph stations to be established in Amoy, Foochow, and two intermediate towns, Hinghua and Chuenchan. The working of the line to be undertaken by the Company for account of the Chinese Government."

## THE TELEGRAPHER'S MUTUAL BENEFIT ASSOCIATION.

## RECEIPTS OF ASSESSMENTS.

New York, June 28, 1875.

## ASSESSMENT No. 76.

22, 25, 29, 33, 52, 54, 58, 59, 60, 67, 72, 101, 108, 141, 142, 144, 145, 153, 172, 176, 177, 178, 179, 184, 185, 186, 187, 188, 189, 190, 191, 193, 197, 198, 201, 202, 220, 230, 247, 254, 267, 302, 323, 367, 379, 381, 391, 392, 393, 398, 416, 418, 426, 431, 438, 476, 526, 547, 552, 554, 565, 575, 586, 592, 608, 604, 605, 649, 655, 659, 671, 685, 691, 695, 697, 705, 708, 714, 729, 734, 735, 742, 750, 751, 756, 799, 820, 831, 842, 843, 855, 874, 880, 901, 912, 941, 952, 978, 998, 1001, 1005, 1023, 1040, 1047, 1054, 1071, 1081, 1085, 1088, 1090, 1143, 1147, 1155, 1156, 1157, 1159, 1160, 1163, 1177, 1185, 1186, 1200, 1208, 1225, 1226, 1227, 1233, 1273, 1276, 1282, 1304, 1325, 1364, 1365, 1385, 1390, 1391, 1400, 1402, 1408, 1404, 1407, 1410, 1417, 1436, 1440, 1448, 1484, 1498, 1505, 1524, 1531, 1554, 1555, 1556, 1557, 1599, 1570, 1582, 1593, 1594, 1613, 1615, 1620, 1623, 1626, 1630, 1635, 1644, 1656, 1670, 1681, 1684, 1687, 1688, 1696, 1707, 1709, 1710, 1718, 1721, 1723, 1724, 1729, 1745, 1773, 1775, 1790, 1791, 1798, 1799, 1809, 1810, 1811, 1812, 1839, 1840, 1841, 1847, 1852, 1889, 1903, 1907, 1917, 1919, 1922, 1924, 1925, 1938, 1942, 1945, 1946, 1965, 1972, 1985, 1987, 1991, 2015, 2021, 2025, 2027, 2029, 2041, 2044, 2045, 2069, 2072, 2083, 2089, 2103, 2113, 2114, 2118, 2141, 2142, 2151, 2159, 2173, 2175, 2180, 2181, 2183, 2184, 2185, 2191, 2196, 2200, 2201, 2204, 2205, 2206, 2212, 2214, 2216, 2221, 2234, 2236, 2243, 2248, 2250, 2263, 2273, 2290, 2295, 2296, 2297, 2298, 2299, 2306, 2313, 2314, 2316, 2317, 2319, 2330, 2331, 2333, 2334, 2335, 2336, 2341, 2342, 2344, 2349, 2351, 2358, 2367, 2373, 2379, 2381, 2385, 2387, 2388, 2390, 2391, 2392, 2393, 2394, 2396, 2403, 2412, 2413, 2417, 2418, 2419, 2421, 2424, 2431, 2432, 2433.

## ASSESSMENT No. 75.

113, 566, 594, 1069, 1232, 1267, 1572, 1590, 1619, 1678, 1718, 2024, 2038, 2048, 2238, 2257, 2261, 2280, 2355, 2356, 2378, 2380.

## ASSESSMENT No. 74.

863, 1207, 1609, 2128.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgment of the receipt of one assessment should be taken as a receipt for all previous assessments.

## THE FIFTH INTERNATIONAL TELEGRAPH CONFERENCE.

The Fifth International Telegraph Conference assembled at St. Petersburg, Russia, on the 2d ult. Representatives from all foreign countries and foreign telegraphic administrations are present, the British Postal Telegraph Department being represented by Mr. H. C. Fischer, the Controller of the Central Telegraph Station in London, and Mr. Allan E. Chambre, the Surveyor of the Private Wire Branch of the department. Col. Robinson with Maj. Bateman represent the Indian Telegraph Department; Sir James Anderson and Mr. Lewis Wells (formerly of the Electric and International Telegraph Company) the Eastern Telegraph Company; Sir James Carmichael and Mr. S. M. Clare the Submarine Company; Mr. Andrews the Indo-European Company, and Mr. H. G. Erichsen the Great Northern Company.

The principal business of the conference will be the codification of regulations arrived at on previous meetings, so as to secure some uniformity in the treatment of international messages. An important proposition, having for its object the reduction of the minimum number of words in foreign European messages from 20 to 10, and a corresponding reduction of the tariff for such messages, will be brought forward; and the attention of the conference will be asked to a somewhat similar proposition with regard to extra European messages. The sittings of the conference will, it is anticipated, extend over a period of six weeks.

Mr. E. W. BARNES has been appointed Manager of the New Orleans, La., office.

## THE SIXTH CINCINNATI EXPOSITION.

The Sixth Cincinnati Industrial Exposition will open to the public on Wednesday, September 8th, and continue until Saturday, October 9th. This year the Managers have decided to form a distinct class of the electrical and telegraphic apparatus and supplies, and offer no less than thirty-five premiums to exhibitors of this class of machinery. The following is the list:

Best System for Simultaneous Transmission of two or more messages over same wire (in operation).....	Gold Medal.
Best System for Automatic Telegraphy (in operation).....	" "
Best System for Fire Alarm Telegraphy (in operation).....	" "
Best System for Private Line Telegraph (in operation).....	Silver Medal.
Best System for Transmission of Musical Sounds by Electricity.....	" "
Best System for Automatic Fire Alarm Telegraph (in operation).....	" "
Best System for Telegraphic Railway Signal.....	" "
" " " Adaptation of the Telegraph to Domestic Use.....	" "
Best Fire Alarm Signal Box.....	" "
" Display of Instruments and Supplies.....	" "
" Instrument for Quotations.....	" "
" Electric Engine, Motor for Light Work.....	" "
" Galvanometer.....	Bronze Medal.
" Telegraph Battery.....	" "
" Electric Light.....	" "
" Electric Hotel Annunciator.....	" "
" Box Relay, Key attached.....	" "
" Pocket Relay Magnet.....	" "
" Morse Register.....	" "
" Single Cut-Out.....	" "
" Switch for from four to twenty Wires.....	" "
" Telegraph Set (Key, Sounder and Relay).....	Silver Medal.
" Electric Magnetic Motor.....	" "
" Magnetic Watchman's Clock.....	" "
" Printing Instrument for Private Line.....	" "
" Dial Instrument for Private Line.....	" "
" Coil Wire.....	Bronze Medal.
" Sample Office and Magnet Wire.....	" "
" Submarine Cable.....	" "
" Air Cable.....	" "
" Amateur Instrument.....	" "
" Insulator.....	" "
" Electric Gas Lighting Apparatus.....	" "
" Burglar Alarm.....	" "
" Electric Clock.....	" "

## THE TELEGRAPH IN EGYPT.

In the later years of the life of Mahomet Ali he caused a semaphoric telegraph to be established for communication between Alexandria and Cairo. There were seventeen stations intermediate between these terminal points, and signaled from one to another with so much rapidity that messages from Cairo were received at Alexandria in forty minutes, and the chronicler takes pains to add: "Those from Alexandria were received at Cairo in the same interval of time." This mode of telegraphic communication of course yielded to the electric telegraph, by which Cairo is now connected not only with Alexandria, but with the most remote parts of Egypt, there being more than four thousand miles length of line, and double that extent of wire. The whole is operated by the Morse instruments. The submarine telegraphs in the Mediterranean on the one side and in the Red Sea and Indian Ocean on the other, of course complete the telegraphic communication with every part of the world. Despatches between Cairo and Washington are, in fact, exchanged within twenty-four hours, including all delays in transmission and the necessary pause for the preparation of answers.

WEST INDIA AND PANAMA TELEGRAPH.—The traffic receipts amounted for the month of March to £4,705, as compared with £2,447 in the corresponding month of 1874.

## CORRESPONDENCE.

## TESTS OF INSULATION.

NASHVILLE, TENN., June 23, 1875.

To the Editor of the Journal of the Telegraph:

Presuming that the tests published in the JOURNAL of June 15th as deemed worthy of record are so deemed as exhibiting the comparative merits of the several insulators, it is proper to be stated that the test of square glass exhibited therein is not a fair average one. For example: the resistance of line No. 9 was 806,260, which is the lowest of eight tests, averaging  $1\frac{1}{2}$  to 2 megohms; line No. 1 was 692,094, the lowest of two tests, the other being 1,067,040; and line No. 4 was 665,406, the lowest of seven tests ranging up to 3,000,000 and averaging 1,500,000. These include all real wet-weather tests in about twelve months, the rains ranging from 8 to 24 hours.

It should be stated also that the particular pin and glass referred to in Kentucky are all P. & A. cemented insulators, with a single exception. The exception, a screw glass, is reported 3,507,666, which is in fact one of the lowest of eleven tests of the same line, three being over 6,000,000, one after 18 hours' and 2 after 8 hours' rains.

The exhibited test of cemented glass lines Nos. 2 and 5 are also, with one exception, the lowest test made of these lines.

The square glass is an inferior insulator to the pin and glass, but is in some cases much the most serviceable, and should be fairly reported.

I will add that the recorded test for conductivity of the Kentucky lines, like that for insulation, is in every instance worse than the average of each wire reported in the last descriptive reports.

Altogether the test of Kentucky lines is about the most unfavorable one made since the galvanometer came into general use, and as such exceptional tests do not afford reliable conclusions, they should not be deemed worthy of record. G. W. T.

## THE TELEGRAPH IN WESTERN AUSTRALIA.

Almost all the towns of Western Australia are now connected by telegraphic wires. Albany, King George's Sound, is united with Perth, the capital, whence wires run to every place of importance north and south, with the exception of Geraldton. As the work of telegraphic extension is rapidly progressing, it is expected that in a short time a line will be carried to the last-mentioned town. The colonial parliament has voted £15,000 for the construction of a line from Western Australia to South Australia. The charge made for the transmission of messages between any two stations in Western Australia is 1s. for the first ten words, and 6d. for each additional word.

## A NEW SWINDLING DODGE.

It has remained for a St. Louis artist to devise and attempt a swindling scheme which is admirable for its novelty, though it chanced to fail at the first time, and is of no further value. The device consists in bringing two telegraphic dispatches and a signature book to a wealthy man for his signature, the page of the book being so cut and underlaid with a blank check that the signing of the name twice would give the clever operator a check both endorsed and signed. The business man narrowly escaped the trap, which failed for lack of a little forethought, as the paper beneath, not being securely fastened, slipped enough to attract attention as the name was being signed the second time. This small circumstance defeated the pretty plan, and saved the discoverer a big deficit in his bank account.



## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company,

195 Broadway, New York.

NEW YORK, JULY 1, 1875.

### NOTICE OF REMITTANCES.

We call again attention to the order of the Treasurer directing a notice by postal card of remittances. *That order will be enforced.* To prevent it being overlooked we insert it here, and request prompt and universal compliance therewith:

TO ALL SUPERINTENDENTS AND MANAGERS.

Hereafter, notice must be sent to J. B. Van Every, Auditor, by postal card, of every remittance to the Treasurer.

These notices must, in every case, be mailed on the same day that the remittance is sent.

They will not take the place of blank No. 65, which must be enclosed with the remittance, as hitherto.

The advice which has heretofore been sent (by some offices) to the Treasurer, separately from the remittance, may be discontinued.

R. H. ROCHESTER, Treasurer.

NEW YORK, June 15, 1875.

SUPERINTENDENTS and managers are informed that the new form, No. 68, is a printed postal card, to be used in sending notice to the Auditor of remittances made to the Treasurer. These forms can be obtained by requisition upon the Supply Department.

THE regular quarterly dividend of the Western Union Telegraph Company, two per cent, declared June 9th, is payable at the office of the Treasurer of the Company, Western Union Telegraph Building, on and after July 15th. The transfer books are closed until July 16th.

Mr. GEO. W. TRABUE has been appointed Superintendent of the Second District of the Southern Division, in the place of Mr. J. B. Tree. The Headquarters of the District will soon be removed to Nashville, Tenn., but will continue at Louisville, Ky., until further notice.

### THE U. S. DIRECT CABLE.

It is more than a year since the steamer *Faraday*, built especially for the work, and supposed to be, in her adaptations, superior to any other ship that had ever been employed in the work of laying cables, not excepting even the *Great Eastern*, started from the coast of Ireland to lay a cable, whose friends alleged was not only to compete successfully with the four cables of the Anglo-American Company, but, through its connection with the great Atlantic and Pacific Company of the United States, was to effect the destruction of the Western Union.

We will not speak now of the accidents, the tribulations and disappointments which have befallen the enterprise. Only a few weeks ago it was announced that the final effort to recover the numerously lost cable had been successful, and that its operation was about to commence. Since then, however, it has been ominously silent, and we now learn from an authentic source, that, after the connection between the coasts of the United States and Ireland had been made, it was found that the cable would not work successfully by reason of a serious fault in water a thousand fathoms deep; that the *Faraday* had been dispatched to repair the fault, and has succeeded only in again breaking the cable.

There is reason to believe that even if it shall be recovered, and this particular fault be cut out, that the rough treatment to which the cable has been subjected during the past year has injured it so seriously that it will never be able to perform satisfactory work.

### WHOSE CHILD IS IT?

There was always to us something deeply pathetic in the very name of Marryatt's novel, in which he describes a poor youth, named Japhet, in search of his father. Orphanhood of such a character and under such circumstances struck our young imagination, as it came up before us many years ago, as specially sad. Since that time, however, we have listened to the pip of so many chickens after parental hens that Japhet had faded from our memory, and we were conscious of having become hardened to that department of the world's sorrow. Recently, however, a new phase of misery has come up before us in the case of an over-fathered child, which first by one parent, and then trotted out by another as its responsible father, asks for a portion of the world's compassion. The object of our special concern, while we now write, is our friend George Little, C. E., of Passaic City, N. J., who comes before the public in the following unique advertisements as the original incubator, parent hen, and father in general, ahead of all other parents, of the *American Automatic Telegraph*, and claims the right of eminent domain over his offspring. We give him the privilege of speaking first, for we know he has been sitting on automatic

eggs long enough to have raised a very respectable brood.

ADVERTISEMENT No. 1.

### "American Automatic Telegraph."

The only reliable and economical SYSTEM for "POSTAL" and commercial services. Is now in use on the lines of the ATLANTIC and PACIFIC Telegraph Company. The right, title and claims to the above being my exclusive property, which I now offer for sale. The price being \$50,000 in gold (for thirty-seven United States Patents), in part cash and good security.

The same SYSTEM as used by the LATE Automatic Telegraph Company during the past four years.

GEORGE LITTLE, Passaic City, New Jersey.

June 22, 1875.

ADVERTISEMENT No. 2.

### Little's, or, the "American Automatic Telegraph."

WILL the ATLANTIC AND PACIFIC TELEGRAPH COMPANY of the CITY OF NEW YORK—or any other parties—inform the public and me, the undersigned, when and where the RIGHT, TITLE and CLAIMS to the above SYSTEM was sold, and by whom and upon whose authority? If so, what was the consideration, and who paid the same? I hereby publicly declare that said system is not sold, and no consideration has been received by me. To the contrary, I have a SALARY claim against the LATE Automatic Telegraph Company of TEN Thousand Dollars, with a continuous claim for salary of four hundred dollars PER MONTH during the LIFETIME of MY PATENTS, independent of ROYALTY claims.

I hereby inform all parties concerned that FOUR HUNDRED THOUSAND DOLLARS was expended upon machinery and apparatus supposed to have been got up in the name and interest of one EDISON of NEWARK, N. J., entirely against MY ADVICE. FIFTEEN PER CENT., by a PRIVATE contract, went to the President of the LATE Automatic Telegraph Company, GEORGE HARRINGTON, of Washington, D. C. THIS is a reply to the annexed communication, just received by me, and signed J. C. REIFF (postmarked June 22 inst.)

GEORGE LITTLE, Passaic City, New Jersey.

June 23, 1875.

FIFTH AVENUE HOTEL, NEW YORK.

MR. LITTLE:

WILL you please call to see me the next time you are in NEW YORK? What possible good do you suppose can be done by PUBLICLY advertising to sell what you sold years ago. YOU have already sufficiently damaged your own interest without committing actual suicide. Resp., J. C. REIFF.

Now, is not this the very child which the President of the Atlantic and Pacific Company announced as the offspring of 36 patents, and as having been acquired by that delightful Company? And where is Edison, and Craig, and Harrington, and all the other fathers and foregatherers in the automatic nest? And is it not true that if there be any value at all in the automatic system as developed in America, it is due to a parentage as yet unnamed, and the fruits of whose invention have been, with sublime impudence, acquired by these pawnbrokers of stolen goods.

### CHANGE IN GOVERNMENT RATES.

By invitation of the Postmaster-General, a conference between that officer and Presidents Orton, of the Western Union, and Blossom, of the Southern and Atlantic Company, and a representative of the Atlantic and Pacific Company, took place on Tuesday, 29th ult., the subject being a contemplated reduction in the rates now paid by the Government for telegraphic service. The conference was satisfactory, and resulted in the adoption of Mr. Orton's proposition that the word-rate remain as at present, one cent for each circuit of 250 miles, the maximum number of circuits for which the Government shall pay on any one message, however, to be limited to ten.

## BATTERY COVERS.

When it was proposed to use oil on the surface of the cells of the gravity battery to prevent evaporation, it was thought a very simple and effective and economical device. No doubt it was, and is; and yet oil is an unpleasant element. To cleanly hands it is offensive. In warm weather or in a heated room it has an odor very ungrateful to the ordinary sense; and even with its use in preventing evaporation, it is usually found necessary to add water, at least monthly, as well as to clean the parts—which latter, by reason of the oil, is far from being a pleasant duty.

Mr. Geo. F. Milliken, manager of the Boston office of the Western Union Telegraph Co., writes as follows in reference to this subject:

"I have now in the battery room a few cells without oil with wooden covers—one with zinc, one tin. The metallic covers are made with a rim one inch wide, fitting the cell, but not too closely. The openings for the wires and the space round the rim are filled with paraffine and tallow. They were set up May 7th for use in local circuits, and now (June 24th), without a drop of water added to them, there is no sign of diminution, and all are clean and neat as at first. The wooden coverings were put on May 19th, and the cells look well. These covers can be made for less than the cost of oil, and are permanent."

All experiments of this kind are valuable, and to us it appears particularly so when any improvement is suggested which tends to cleanliness and neatness as well as economy. We think it not unlikely that Mr. Milliken's experience, if confirmed by prolonged tests, may lead to a change in the present directions respecting the use of oil in batteries.

THE messenger boys of the American District Telegraph Company, 400 strong, parade on Broadway, New York, July 5th. The finely drilled Boy Band of the Soldiers' and Sailors' Orphan Home, in new and handsome uniform, led by Col. Johnston, of the Home, provide the music. Many of the boys in this Band are expert telegraph operators, having been instructed at the Home by a competent teacher. If the day is fine the parade will be very attractive.

WE have received the "Manual of Telegraphy and Catalogue of Private Line Instruments," issued by the Western Electric Manufacturing Company of Chicago. The Manual, which has been prepared by Mr. George H. Bliss, the General Agent of that Company, contains much useful information for beginners in the art, besides a number of easy lessons in dots and dashes.

THE American District Telegraph system is being introduced in New Orleans, La., under favorable auspices. The company has been organized under the laws of Louisiana, and are now engaged in constructing their lines and fitting up their offices, and announce that they will be prepared to commence business on the first of September next.

## THE GOVERNMENT OF CANADA AND THE TELEGRAPHS.

[From the Railway News.]

A correspondent in Canada has forwarded an official copy of the protest of the minority of the Senate which disapproved the passing of the Act by which the Government of Canada has, with such short-sighted policy, sought to interfere with the vested rights of the Anglo-American Telegraph Company. On a previous occasion we gave the substance of this protest, but we did not give the names of the senators who had signed the document. Our correspondent states that he fully approves of everything that we stated "with respect to this unnecessary and wanton interference on the part of the Government of the Dominion," but thinks "that the names of the gentlemen who opposed the passing of this impolitic measure should be known in England, and that the whole of the members of the Senate should not be censured for an Act which an influential section resolutely but vainly opposed." Our opinion of the impolicy of this Act has been freely given on several occasions. We have pleasure, therefore, in complying with the wish of our correspondent, and give the protest of the dissentient members of the Senate to the third reading of the bill in the House of Commons entitled "An Act to regulate the construction and maintenance of Marine Electric Telegraphs," as amended by the Committee on Banking, Commerce and Railways—

"First.—Because the Act of the Nova Scotia Legislature incorporating the Nova Scotia Electric Telegraph Company in 1851 authorized them to build telegraph lines to any part of the province, 'and through, across and under any stream, gulf, strait or body of water.' They accordingly laid a cable across the navigable strait of Canso, and on the 5th of August, 1855, entered into a written agreement with the New York, Newfoundland and London Company, granting them the privilege of landing a submarine cable in Cape Breton, and making a land line to connect with the Nova Scotia wires at Port Hood, 'in the name and under the authority of the Nova Scotia Company;' and under this agreement the cable was laid in 1856, land lines built, and several cables between the two islands, with hundreds of miles of land wire over Cape Breton, were subsequently built under similar agreements, and have continued ever since to be used without molestation.

"Second.—Because it appears from a report of a committee of the Nova Scotia Assembly in 1857, including the Attorney and Solicitor General, that they were not only aware of the first cable being laid, but approved of it, and the three branches of the Legislature in 1857 passed an Act validating these agreements, which was disallowed in 1858 on the sole ground that it gave exclusive privilege of landing cables for twenty-five years.

"Third.—Because, after this long and uninterrupted acquiescence, it is not desirable nor proper to legislate so as to compel the Anglo-American Company to remove their wires at three months' notice, unless they yield up a privilege acquired twenty-one years ago by an Act of the Newfoundland Legislature, approved by the Queen, and since recognized by the Prince Edward Island Legislature, by the Legislature of United Canada in 1855, by the Imperial Parliament in the Act incorporating the Atlantic Telegraph Company in 1857, and subsequently in the General Telegraph Act of 1863; all these acts being still in force, and agreements having been made under them with the Imperial Government and the United States Government for transmission of messages over the existing lines, and it would be a great wrong to override rights thus acquired.

"Fourth.—Because it is not in the public interest thus to deprive the Dominion of the benefits of telegraphic communication with Newfoundland, and of open competition through the existing cables with any future company, and thereby prevent cheap telegraphy, and probably place the public at the mercy of a single company with a single wire from the Dominion, with unlimited powers of tariff charges.

"Fifth.—Because the bill is unnecessary, inasmuch as the shores of Nova Scotia are open to free competition, and cables may be landed direct from Ireland or *via* St. Pierre, where a much longer cable than from Ireland to Newfoundland has been laid and worked, and where there is no exclusive privilege, the route from Scotland *via* the St. Lawrence being also available.

"Sixth.—Because the effect of the bill being carried out would be to depreciate the Nova Scotia Company's line, and imperil the keeping up of the local and non-paying lines by taking the remunerative cable business from the paying portion of the lines.

"Seventh.—Because the policy of withdrawing the exclusive privilege, without which the Atlantic cable would not have been undertaken, is a question to be settled between the Newfoundland Government and the Legislature and the Anglo-American Company, and it is unwise to coerce the people of Newfoundland by a threat of non-intercourse into the alternative of pre-emption at enormous cost, of which we pay no part, or telegraphic disconnection from their fellow colonists.

"Eighth.—Because this legislation is partial in prohibiting any interchange of messages between existing Canadian companies and a company enjoying a monopoly in Newfoundland, while permitting it to a favored company with all the world where monopolies exist except Newfoundland and Denmark.

"Ninth.—Because the legislation is *ex post facto*, contains no reservation of existing rights, and is calculated to affect injuriously our credit abroad."

(Signed) John Hamilton (Kingston), David Wark, R. B. Dickey, H. A. N. Kaulbach, J. C. Chapais, D. Reesor, Robert Reid, George W. Howland, Clement F. Cornwall, W. O. Truedel, Joseph H. Belle-rose, \*J. C. Aikins, Alexander Vidal, A. E. Botsford, J. Skead, †G. W. Allan, †T. Ryan.

The Senate, Saturday, March 20, 1875.

## THE LIZARD LIGHTS.

The lights at the Lizard are now undergoing considerable alterations. New lanterns are in course of construction. The source of light in future will be the magnetic electric, on the principle invented by Professor Holmes, combining all the latest improvements which he has lately made. The dioptric apparatus has been specially designed and constructed for the magnetic electric light. The machines for the production of these lights will be worked by Ericsson's caloric engines in lieu of the steam engines hitherto in use, thus entirely removing all risk of explosions and the necessity of water supply. It is intended also to establish a powerful "Syren" fog signal at this station to warn mariners, in thick weather, of their proximity to the coast. This Syren will be worked by the same engine. The works are being rapidly carried forward, and it is expected that the lights will be exhibited by next Christmas.

\* Dissents for the 5th, 7th, and subsequent reasons.

† Dissentients for the 5th, 7th, and subsequent reasons, and also for the further reason that the bill does not appear to be a *bona fide* public measure, but introduced mainly at the instance and in the interests, of a particular company, and directed in a great measure against the rights and interests of another company.

## FOREIGN ITEMS.

**CUBA SUBMARINE.**—The number of messages sent over this Company's lines during the month of May (including those received at the new station in Cienfuegos) was 2,481, estimated to produce £2,400, against 1,788 messages, producing £1,851, in the corresponding month of last year. The actual receipts for the three months ending March amounted to £7,154, as compared with the estimated amount of £7,100.

**EASTERN TELEGRAPH.**—The traffic receipts for the month of May, 1875, amounted to £30,602, and in the corresponding period of 1874 to £30,225.

**THE Indo-European Telegraph Company** notify that the average time in transit between London and India, *via* Teheran, of all outward messages to India, including the messages for Penang, Singapore, China, Japan, Java, and Australia, during the week ending the 4th inst., was one hour seventeen minutes.

**THE construction of a new land line of telegraph** between Amoy and Foochow has commenced in virtue of the agreement lately concluded with the Chinese Government by the Great Northern Telegraph Company.

**THE Secretary of the West India and Panama Telegraph Company** announce that information has been received of the interruption of two of the Company's cables, *viz.*, between St. Thomas and St. Kitts, and between Grenada and Trinidad, in consequence of which telegraphic communication with St. Kitts, Antigua, Guadalupe, Dominica, Martinique, St. Lucia, St. Vincent, Barbadoes, and Grenada, is for the present suspended. The Company's ship (screw steamer) Investigator has already left St. Thomas to effect the repairs. The repair of either of the broken cables will restore telegraphic communication with the islands cut off. The interruption of the cables named does not interfere with telegraphic communication with Jamaica, Panama, Porto Rico, St. Thomas, St. Croix, Trinidad, Demerara, and Barbice.

**THE new cable about to be laid between Australia and New Zealand**, in connection with the Eastern Extension Telegraph Company's system, will receive special guarantees as to rates from the New Zealand Government. The contract for the new cable will be undertaken by the Telegraph Construction and Maintenance Company.

## HOW INVENTIONS ARE MADE.

The life of George Stephenson proves that, notwithstanding the novelty and great importance of his improvements in steam transit, he did not discover these improvements. He did not discover that a floating embankment would carry a railway across Chat Moss, neither did he discover that the friction between the wheels of a locomotive and the rails would enable a train to be drawn by tractive power alone. Everything connected with his history shows that all his improvements were founded on a method of reasoning from principles, and generally inductively; to say that he "discovered" our railway system, according to the ordinary construction of the term, would be to detract from his hard and well-earned reputation, and place him among a class of fortunate schemers who can claim no place in the history of legitimate engineering.

Count Rumford did not by chance develop the philosophy of forces, upon which we may say the whole science of dynamics now rests. He set out,

upon a methodical plan, to demonstrate conceptions that were already matured in his mind, and to verify principles which he had assumed by inductive reasoning.

The greater part of really great and substantial improvements which have performed any considerable part in developing modern mechanical engineering have come through this course of first dealing with primary principles, instead of groping about blindly after mechanical expedients; and present circumstances point to a time not far distant when chance discovery will quite disappear.—*Engineering.*

## MUSIC WITHOUT HANDS.

**AN ELECTRICAL MACHINE THAT READS NOTES AND PLAYS AN ORGAN WITH TWO HUNDRED FINGERS.**

[From the N. Y. Tribune.]

**PHILADELPHIA, June 11.**—The acme of machine-music appears to have been attained in an ingenious invention just perfected by Messrs. Schmoel of this city, which was exhibited last evening in Horticultural Hall to a few invited guests. The apparatus reads notes and plays upon an organ with absolute correctness of time and touch, the only assistance given it by the operator being to feed in the end of a roll of music and start the machinery in motion. Organs have been played by electricity before, but the only part performed by the electric fluid has been to transmit the power from a distant bank of keys to open the valves of the instrument. Such an electrical organ has been exhibited in London for some time past. In the Schmoel instrument the electric current is endued with a seeming intelligence, and distinguishes the notes in the same way that a blind man does—by feeling. Marvelous as this appears at first thought, it is simple enough. The score is written on a long roll of stout paper by cutting holes through it in the form of squares, or parallelograms. The reading instrument, which is about as large as a sewing-machine, is provided with a multitude of small brass fingers, each of which is connected by a wire with the pipe of the organ which it operates. The roll of music is fed in over a brass tube. When the fingers rest on the paper no electric current is transmitted, because paper is a non-conductor; but whenever they fall into the holes cut in it they touch the brass below, the current is transmitted, and the sound produced.

The length of the note is governed by the length of the slit in the paper. A noiseless bellows-machine, run by wind conducted through a pipe from the organ, works the feeding apparatus. To aid in producing orchestral effects, drums, cymbals, bells, &c., are added to the ordinary pipe organ, and operated by electricity in the same manner as the pipes. A greatly increased volume of sound and much richer harmonic combinations can be made by this instrument than it is possible for a single performer to produce upon an organ, in consequence of the fact that the performer has only his ten fingers, while the electrical machine has 200, and can strike as many notes at once as desired. All the notes on the organ that can be combined into a chord can be brought out together. The overtures to "Semiramide" and "William Tell" were performed last evening with pleasing effect. As the reading instrument is mechanically accurate, and the score correctly written, there were of course no false notes. It was obviously machine music, however, but machine music of the highest order, and might have been mistaken for the performance of a well drilled but rather spiritless orchestra. The inventors hope soon to apply their device to a piano.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

Established Oct. 22, 1867.

**Its object is to Aid the Families of Deceased Members,**

**BY THE PAYMENT TO THE HEIRS OF \$1,000.**

Any person who is, or who has been, employed in telegraph service in any capacity, may become a member of this Association upon giving proof of good health and habits, and payment of the required fees.

**INITIATION FEE, \$2.00.**

**Payments required: One Dollar upon the Death of each Member.**

Application blanks, copies of the By-Laws, and other information furnished upon application to the Secretary, or any of the Agents. A list of the Agents will be published in the next issue of THE JOURNAL.

The attention of former members of the Association is called to the following resolution, passed at the last Annual Meeting of the Association:

*Resolved, That delinquent members shall be eligible to renewed membership on payment of back dues to an amount not exceeding five dollars, and without further initiation fee.*

W. HOLMES, Secretary.

J. D. REID, Treasurer.

Box 3175, New York.

N. B.—Members will please note change in number of Post Office Box.

## REMOVAL.

## GEO. H. BLISS &amp; CO.

We respectfully announce our removal to 220 Kinzie Street, Chicago, Ill. Having determined to transfer our interests to the Western Electric Manufacturing Co., we offer our entire stock of Telegraph Instruments, Goods and Machinery for sale upon terms which cannot fail to prove desirable to purchasers. Until our stock is disposed of we shall continue in the trade, and solicit a continuance of the patronage which has been so liberally bestowed by our many friends heretofore.

GEO. H. BLISS, Pres't.

220 KINZIE ST., CHICAGO, ILL.

## ANNOUNCEMENT.

## Western Electric Manufacturing Company.

Geo. H. Bliss having acquired an interest with this Company, has been appointed its General Agent.

His attention will be given to the sale of the Instruments and Goods of our manufacture and in which we deal.

In addition to our former line we have added the various specialties heretofore controlled by Geo. H. Bliss & Co.

With our ample facilities we hope to give to customers and the trade increased satisfaction in prices, quality and variety of our goods.

We invite correspondence and solicit patronage.

**Western Electric Manufacturing Co.,**

**220 KINZIE ST., Chicago, Ill.**

April 15th, 1875.



**OPERATORS' CHANCE.**

ELECTROTYPE Cards of Key, Sounder and Relay, with your name printed in handsome type on 25 extra fine Bristol, white and tinted, for 25c., or 50, with business and address, for 50c. Samples 8c. Railroad Operators send 10 cents extra for conductor's and brakeman's electrotype cards. You can make money. Agents outfits, with the handsomest and most stylish cards printed, for 25c. Address,

F. P. MUNN,  
Olyde, Wayne County, N. Y.

WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
New York, June 9th, 1875.

**DIVIDEND No. 33.**

THE BOARD OF DIRECTORS have declared a Quarterly Dividend of **TWO PER CENT.** on the Capital Stock of this Company, from the net earnings of the three months ending June 30th instant, payable at the office of the Treasurer, on and after the 15th day of July next, to shareholders of record on the 19th day of June.

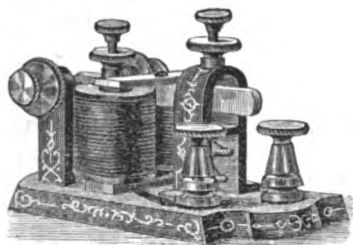
The transfer books will be closed at three o'clock on the afternoon of the 19th inst., and opened on the morning of the 16th of July.

R. H. ROCHESTER,  
Treasurer.

**WANTED—BY YOUNG MAN, FAIR OPERATOR, PLACE** with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 140, Janesville, Wis.

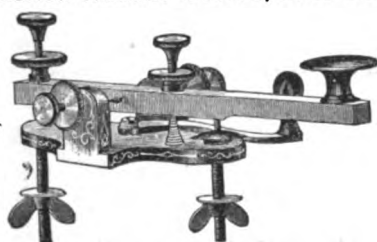
**A Great Reduction in Prices.**

I am now making a specialty of my PHIL. SHERIDAN SOUNDER AND KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.

**PHIL. SHERIDAN, \$4.00.**

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether it is a first-class instrument. The magnets are wound with green silk insulated wire.

**Polished Rubber Covers, 50c. Extra.**

**PHIL. SHERIDAN KEY, PRICE \$2.00.**

You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, &c., &c. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Callaud Battery, 1 lb. Blue Vitriol, Connection Wire, Book of Instruction, &c., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering, please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

A. B. LYMAN,  
91½ SENECA ST., Cleveland, Ohio.

**CALLAUD BATTERY,  
KEPT ON HAND,**

AND  
Orders filled by  
W. MITCHELL McALLISTER,  
728 Chestnut Street, Philadelphia,  
CHARLES WILLIAMS Jr.,  
109 Court St., BOSTON, MASS.

AND BY  
THE WESTERN ELECTRIC MANUF'G CO.,  
Agents for the United States,  
220 Kinzie St., Chicago, Ill.

**LECLANCHE BATTERIES.****IMPORTANT NOTICE.**

After January 1st, 1875, we will allow **20 Cents** for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

THE LECLANCHE BATTERY CO.,  
40 West 18th St.

Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
8 Dey St.

PHILADELPHIA: 54 South Fourth Street.  
CINCINNATI: 22 West Fourth Street.

**The "Snapper" Sounder.**

PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

**PRICE 75 CENTS.**

Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

**EUGENE F. PHILLIPS,**

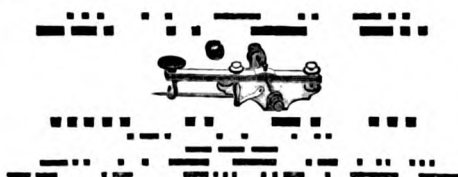
MANUFACTURER OF

Reed & Phillips' Patent Finished Insulated Telegraph Wire,

PATENT RUBBER-COVERED WIRE,  
PATENT ELECTRIC-CORDAGE, CABLES, &c.,

No. 20 CONDUIT STREET,

PROVIDENCE, R. I.



SENT ON RECEIPT OF PRICE.

26 & 27 Waring Block, Cleveland, O.

**AMERICAN LINE.**

Weekly Mail Steamship service between  
**PHILADELPHIA AND LIVERPOOL,**

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from  
Philadelphia.

PENNSYLVANIA,	June 24.	OHIO,	July 15.
INDIANA,	July 1.	ILLINOIS,	July 22.
*ABBOTSFORD,	July 8.	*KENILWORTH,	July 29.

PRICES OF PASSAGE IN CURRENCY.  
Cabin, \$100.

Steorage and Intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate.

Passenger accommodations for all classes unsurpassed.

For passage, rates of freight and other information apply to

GEO. W. COLTON, Agent, 42 Broad Street, N. Y.  
JOHN McDONALD, Passenger Agent, 8 Battery  
Place, N. Y.

PETER WRIGHT & SONS, General Agents,  
307 Walnut Street, Philadelphia.

Richardson, Spence & Co., N. & J. Cummins & Bros.,  
Liverpool. Queenstown.

**Red Star Line.**

Appointed to carry the Belgian and United States Mails.

The following Steamers are appointed to sail

**FOR ANTWERP.**

From Philadelphia.	July 8.	State of Nevada,	June 26.
VAERLAND,	July 31.	SWITZERLAND,	July 20.
NEDELAND,			

**FROM ANTWERP.**

For Philadelphia.	July 8.	SWITZERLAND,	June 26.
NEDELAND,	Aug. 1.	State of Nevada,	July 20.
VAERLAND,			

PRICES OF PASSAGE IN CURRENCY.

First Cabin, \$90. Second Cabin, \$60.

Steorage tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed.

For passage, rates of freight, and other information, apply to

GEO. W. COLTON, Agent, 42 Broad Street, N. Y.  
JOHN McDONALD, Passenger Agent, 8 Battery  
Place, N. Y.

PETER WRIGHT & SONS, Gen'l Ag'ts,  
307 Walnut Street, Philadelphia.

B. vander Becke, General European Agent, Antwerp.

**WESTERN ELECTRIC MANUFACT'G CO.,**

SOLE AGENTS,

**ORTON'S PATENT AWL CLIP.**

These Clips have been in practical use for three years, and are rapidly displacing all others.

They are designed for holding messages and every form of blanks.

For convenience, durability and economy they are unequalled.

Western Electric Manufacturing Co.,

220 KINZIE ST., Chicago, Ill.

**ORTON'S****Patent Security Message Hook**

The damage resulting from the loss of a single message is frequently sufficient to equip a line many times with this hook. Papers cannot be blown or carelessly crowded from it.

These Hooks were first introduced by Geo. H. Bliss & Co. Thousands of them are in use in telegraph offices, banks and counting rooms.

PRICE 30 CENTS EACH, OR \$3.00 PER DOZEN.

Liberal terms to the trade.

Western Electric Manufacturing Co.,

220 KINZIE ST., Chicago, Ill.



**AMERICAN FIRE ALARM**

AND  
**POLICE TELEGRAPH.**

GAMEWELL & CO., PROPRIETORS,

NO. 62 BROADWAY, NEW YORK.

J. W. STOVER,

General Agent and Superintendent.

L. B. FIRMAN, Chicago, Ill.,

General Agent for the West and North-West.

J. R. DOWELL, Richmond, Va.,

Special Agent for Virginia and North Carolina.

J. A. BRENNER, Augusta, Ga.,

Special Agent for Georgia and South Carolina.

L. M. MONROE, New Canaan, Conn.,

Special Agent for New England.

ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,

San Francisco, Cal., Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

**AUTOMATIC PLAN,**

is now in operation in the following cities, to which reference is made for evidence of its great **SUPERIORITY, VALUE and UNIFORM RELIABILITY:**

Albany, N. Y.,	New Orleans, La.,
Allegheny, Pa.	New Haven, Conn.,
Boston, Mass.	Newark, N. J.,
Buffalo, N. Y.,	Omaha, Neb.,
Baltimore, Md.,	Philadelphia, Pa.,
Chicago, Ill.,	Pittsburg, Pa.,
Cincinnati, Ohio,	Portland, Me.,
Columbus, Ohio,	Peoria, Ill.,
Cambridge, Mass.,	Providence, R. I.,
Charlestown, Mass.,	Quebec, L. I.,
Covington, Ky.,	Rochester, N. Y.,
Detroit, Mich.,	Richmond, Va.,
Dayton, Ohio,	Indianapolis, Ind.,
Elizabeth, N. J.,	St. Louis, Mo.,
Fall River, Mass.,	St. John, N. B.,
Fitchburg, Mass.,	Springfield, Mass.,
Hartford, Conn.,	San Francisco, Cal.,
Jersey City, N. J.,	Savannah, Ga.,
Louisville, Ky.,	Syracuse, N. Y.,
Lawrence, Mass.,	Troy, N. Y.,
Mobile, Ala.,	Toledo, Ohio,
Montreal, Canada,	Toronto, Canada,
Milwaukee, Wis.,	Washington, D. C.,
New York City,	Worcester, Mass.,
Lynn, Mass.,	New Bedford, Mass.,
Lowell, Mass.,	Bridgeport, Conn.,

The distinctive features of these systems of

**FIRE ALARM AND POLICE TELEGRAPHS**

ARE,

*First*—The **AUTOMATIC SIGNAL BOXES**, the simple electro-mechanism of which enables any one—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The **AUTOMATIC REPEATER**, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without the constant personal attention of either operators or watchmen.

*Third*—The **ELECTRO-MECHANICAL BELL STRIKERS**, adapted to produce the full tone of the largest church or tower bells.

*Fourth*—The **ELECTRO-MECHANICAL GONG STRIKER**, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

*These features combined form the*

**ONLY PERFECT, COMPLETE, AND RELIABLE SYSTEM**

OF

**FIRE ALARM TELEGRAPH IN THE WORLD.**

Messrs. GAMEWELL & CO. are the owners of the original **FARMER AND CHANNING PATENTS**, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or effort to secure improvements, and the systems are now covered by

**MORE THAN TWENTY PATENTS.**

The introduction and operation of the

**AUTOMATIC SYSTEM**

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

*The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.*

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy upon application as above.

**THE WESTERN ELECTRIC MANUFACTURING CO.**

220 KINZIE STREET CHICAGO, ILL.

KEEP IN STOCK THE FOLLOWING ARTICLES:

**GALVANIZED WIRE,**

**COMPOUND WIRE,**

**SCREW GLASS INSULATORS,**

(Cauvet's Patent).

**BRACKETS, PINS, SPIKES,**

**BROOKS' INSULATORS,**

**PLIERS, VISES, PULLEYS, CLIMBERS,**

**WINDOW TUBES, BATTERY BRUSHES,**

**SYRINGES, FUNNELS, HYDROMETERS,**

**ACIDS AND CHEMICALS FOR BATTERIES,**

**KERITE WIRE,**

**BRAIDED AND WOUND OFFICE WIRE,**

**GUTTA PERCHA OFFICE WIRE,**

**SWITCH CORD,**

**CALLAUD BATTERY,**

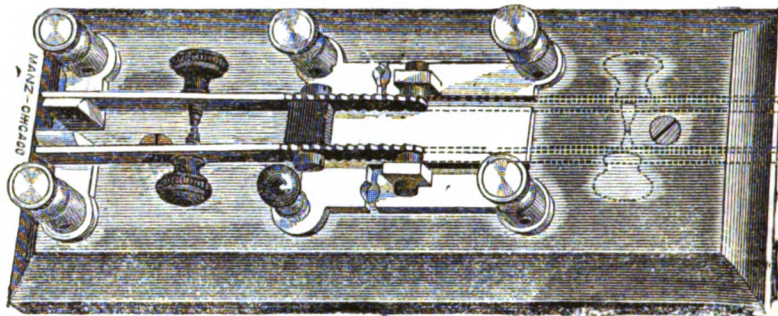
**DANIELL BATTERY,**

**GROVE BATTERY,**

**BUNSEN BATTERY,**

**LECLANCHE BATTERY**

**HILL BATTERY,**



**REGISTERS,**

**RELAYS,**

**BOX RELAYS,**

**SOUNDING RELAYS,**

**SOUNDERS,**

**KEYS,**

**MEDICAL INSTRUMENTS,**

**HOTEL ANNUNCIATORS,**

**PLUG CUT-OUTS,**

**CUT-OUTS, (new style),**

**REPEATERS,**

**SWITCHES,**

**GALVANOMETERS,**

**INDUCTION COILS,**

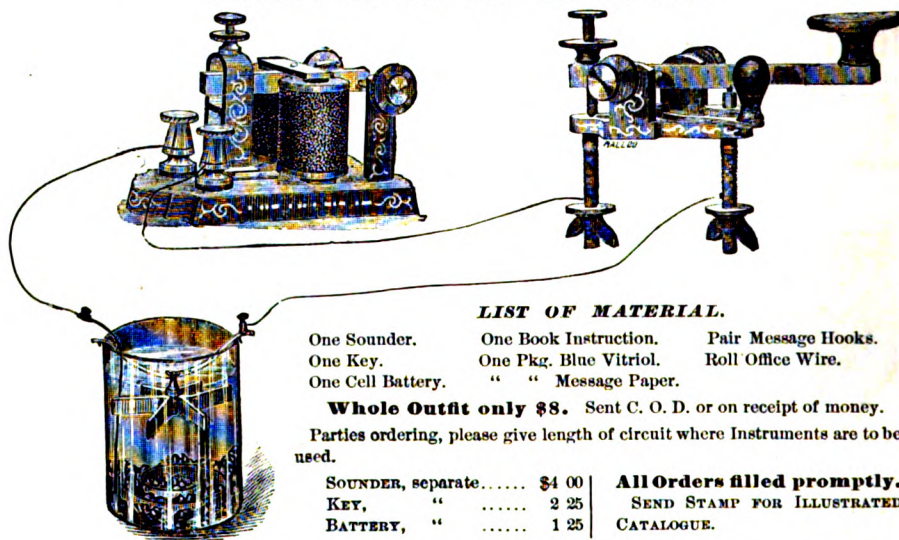
**ALARM BELLS.**

Our Morse Instruments are of the Western Union, Ottawa (or Caton) style.

We have ample facilities for the execution of every variety of electrical work.

**THE EUREKA INSTRUMENT.**

**A COMPLETE SET FOR OFFICE USE.**

**LIST OF MATERIAL.**

One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
One Cell Battery.	" " Message Paper.	

**Whole Outfit only \$8.** Sent C. O. D. or on receipt of money.

Parties ordering, please give length of circuit where Instruments are to be used.

SOUNDER, separate.....	\$4 00
KEY, " .....	2 25
BATTERY, " .....	1 25

**All Orders filled promptly.**  
SEND STAMP FOR ILLUSTRATED CATALOGUE.

**M. A. BUELL, 26 Waring Block, Cleveland, O.**

**NO OTHER MAIN LINE SOUNDER**

has proven as **PERFECT** an INSTRUMENT as that made by us the past two years.

**LOW RESISTANCE, EASY ADJUSTMENT AND**

**HANDSOME APPEARANCE COMBINED.**

No other instrument offered for this purpose has the advantages secured to ours. See other columns of this paper.

**WATTS & COMPANY,**

**No. 47 Holliday Street,**

**BALTIMORE, MD.**

Send for Catalogue and Price List.

**SCREW GLASS INSULATORS AND BRACKETS**

Of the size and thread used by the Western Union Telegraph Company

Having secured an **Exclusive Agency** for these Insulators, (manufactured under the Cauvet patent,) we are filling orders promptly for large or small quantities, at prices as low as any Insulator can be sold for in the market.

**THE WESTERN ELECTRIC MANUF'G CO.,**

**220 Kinzie St.,**

**Chicago, Ill.,**



**WATTS & COMPANY,**  
No. 47 HOLLIDAY STREET,  
BALTIMORE, MD

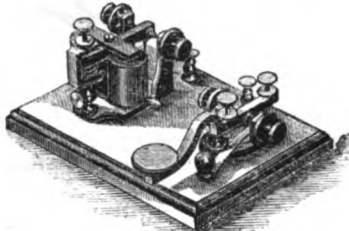
*SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
SWITCHES, GALVANOMETERS,  
RESISTANCE COILS.*

A COMPLETE STOCK OF EVERYTHING FOR THE TELEGRAPH OFFICE OR ELECTRICAL LABORATORY.

Special attention given to repairing Scientific instruments. Several of our workmen having served their time in the most prominent European manufactories, enables us to guarantee satisfaction.

SEND FOR CATALOGUE AND PRICE LIST.

**CHARLES WILLIAMS, Jr.,**  
109 COURT STREET BOSTON.  
[ESTABLISHED 1856.]



\$11.50.

MANUFACTURER OF

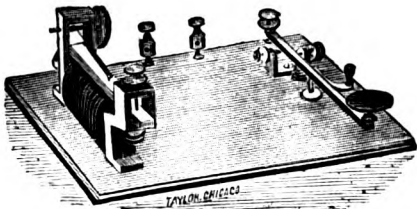
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

## THE AMATEUR Telegraph Apparatus

Comprises SOUNDER, KEY CUP OF BATTERY, CHEMICALS, WIRE AND MANUAL.

Several thousand of these instruments already sold.

They give good satisfaction.



### PRICES:

AMATEUR OUTFIT, COMPLETE, No. 1,	-	-	7.50
" " " " No. 2,	-	-	6.50
" SOUNDER AND KEY, No. 1,	-	-	6.50
" " " " No. 2,	-	-	5.50
BATTERY, PER CELL,	-	-	.65

### DISCOUNTS.

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

**GEO. H. BLISS & CO.**  
20 KINZIE STREET,  
CHICAGO, ILL.

## BUNNELL'S New Giant Sounders Perfected.

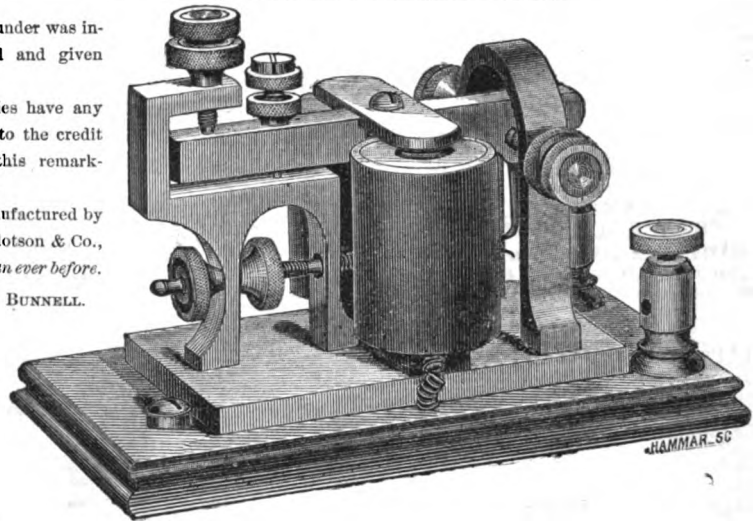
[J. H. BUNNELL'S PATENT, JULY 31, 1875.]

The Giant Sounder was invented, patented and given its name by me.

No other parties have any claim whatever to the credit of originating this remarkable instrument.

It is being manufactured by Messrs. L. G. Tillotson & Co.,  
*more perfectly than ever before.*

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable and substantial shape.

They give enormous sound with but little Local Battery power.

Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder is desired.

**PRICE \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

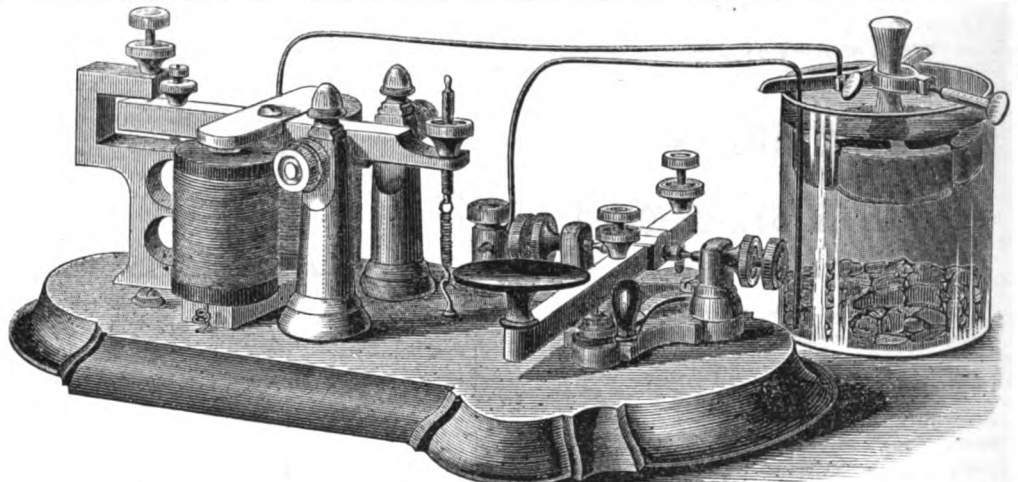
**L. G. TILLOTSON & CO.,**

8 Dey Street, New York,

54 South 4th Street, Philadelphia,

DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

## BUNNELL'S Learners Instrument Perfected!



**Complete and Perfect, full-sized Sounder and Key combined, with Book of Instruction, Battery, Wire and all Necessary Materials.**

[These instruments have been greatly improved in their working qualities and in the style in which they are finished. Those having the latest improvements in their construction are those manufactured *only* by Messrs. L. G. TILLOTSON & CO. JESSE H. BUNNELL.]

**These Sets are made in the best manner, and are just exactly the thing wanted FOR LEARNERS' USES,**

**FOR TELEGRAPH SCHOOLS,**

**Or FOR SHORT LINES, from a few feet to 12 miles long.**

Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials to put in operation, singly or on a short line.....\$8 50

Champion Learners' Instrument, without Battery, &c..... 6 50

Ornamental " Rubber-Covered Coils, &c..... 7 50

Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines up to twelve miles in length, \$1 00 in addition to above prices.

These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order or Draft.

**L. G. TILLOTSON & CO.,**

8 Dey St., New York, 54 South 4th St., Phila., and 22 West 4th St., Cincinnati,  
Dealers in Every Description of Telegraph Materials.



**A SUPERIOR  
PRINTING TELEGRAPH INSTRUMENT,  
FOR PRIVATE AND SHORT LINES,**

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. E. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is **SIMPLE, RELIABLE,** and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

**PRIVATE LINES**

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employes, &c., for the introduction of the Printer.

For further particulars, terms, &c., apply to

**MERCHANTS' MANUFACTURING AND  
CONSTRUCTION CO.,**

S. J. BURRELL, Superintendent,

No. 50 BROAD STREET, Rooms 12, 13, 14.  
P. O. Box 496.

**JOSEPH MOORE & SONS,**

Established 1820,

**535 and 537 CHINA STREET,**

Below Green St.,

PHILADELPHIA, PA.,

**Insulated Wire Manufacturers.**

**INSTRUMENT AND OFFICE WIRES,**

**FLEXIBLE CORDS, CABLES,**

**HEAVY INSULATED LINE WIRE,**

**RESISTANCE WIRE.**

Wires of every variety of Insulation.

**GEO. H. BLISS & CO.,**

**220 KINZIE ST., CHICAGO, ILL.**

TELEGRAPH INSTRUMENTS AND SUPPLIES in great variety, of the latest patterns and highest finish.

Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on Instruments of our manufacture, when remittance accompanies order.

Manual and Price List free.

**GEO. H. BLISS & CO.**

**COPPER  
OFFICE AND MAGNET WIRE,**

**BRAIDED AND WOUND,  
SINGLE and DOUBLE, with COTTON,  
LINEN, SILK;**

Paraffined or Varnished, Compressed and Polished,  
Manufactured and for Sale by

**WESTERN ELECTRIC MANUFACTURING CO.,  
CHICAGO.**

**PARTRICK & CARTER,**

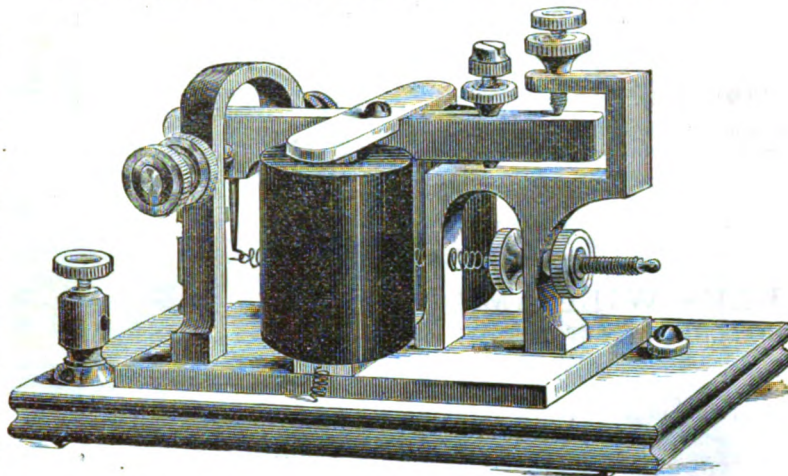
The only Manufacturers of the Original

**GIANT SOUNDER, PERFECTED,**

PATENTED FEBRUARY 16, 1875.

**BEWARE OF WORTHLESS IMITATIONS.**

**OFFICE & MAGNET WIRE,  
BRAIDED AND WOUND, SINGLE and DOUBLE,  
with COTTON, LINEN, SILK;  
Paraffined or Varnished, Compressed and Polished.**



**MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.**

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. **Every Instrument warranted perfect.**

**PRICE, SENT C. O. D., \$7.50,**

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

**CHAMPION LEARNERS' INSTRUMENTS.  
THE BEST OUT.**

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

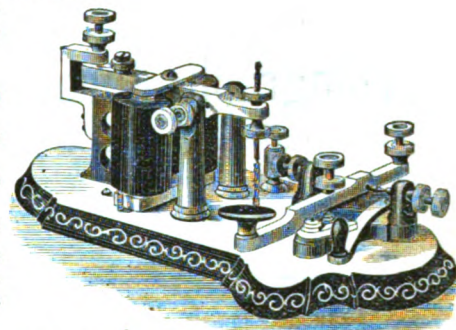
Price of single instrument, good for one mile or less, without Battery, &c. \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7 50

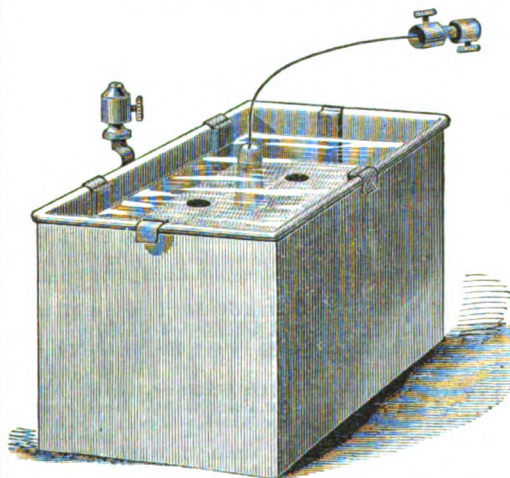
Price of single instrument, good for one to twelve miles, without Battery, &c. 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8 50

*This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.*



**EAGLE'S METALLIC BATTERY.**



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the **best and most powerful of all constant batteries**, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and **DOUBLE THE AMOUNT OF POWER** of any sulphate of copper battery, as long as there is left in the jar ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and **ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.**

For OPEN CIRCUITS, where all other gravity batteries are acknowledged FAILURES, the Eagle's Battery is found to be, in every respect, A PERFECT SUCCESS.

**PRICES:**

No. 1, Square Cell, complete, - \$2.25  
No. 2, Round " " - 2.00

**PARTRICK & CARTER, Sole Agents,  
38 SOUTH 4th STREET, PHILADELPHIA.**

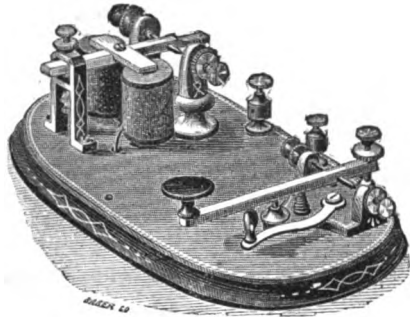


## Western Electric M'fg. Co.,

220 KINZIE STREET, Chicago, Ill.

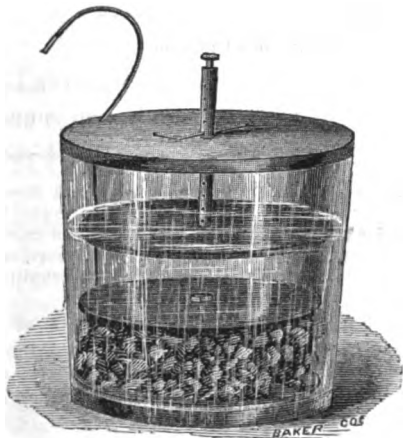
CELEBRATED  
PRIVATE LINE OUTFIT,

THE BEST IN THE MARKET.



## Private Line Instrument

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on line from a few feet to ten miles in length.

BLISS'  
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This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

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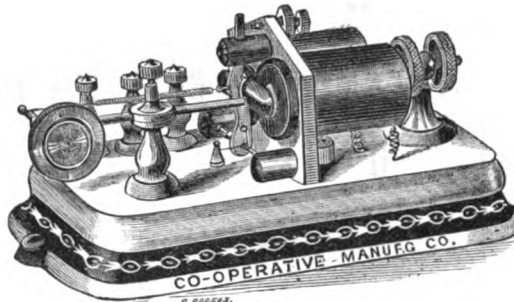
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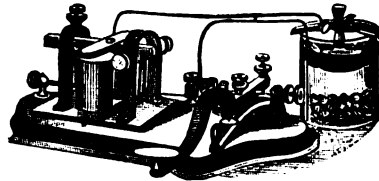
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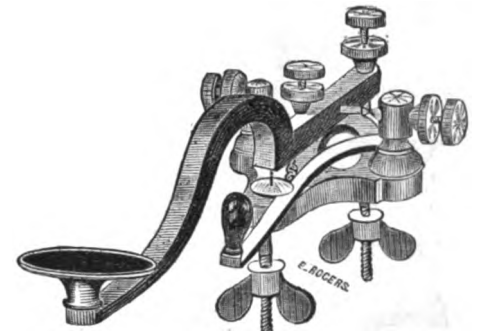
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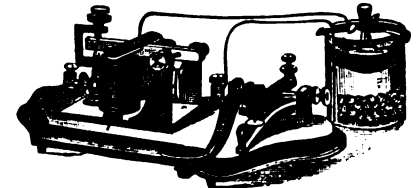
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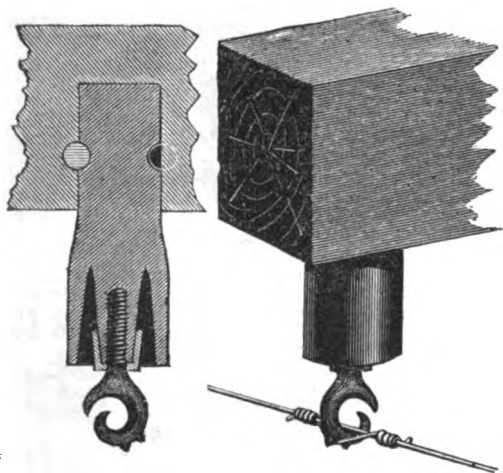
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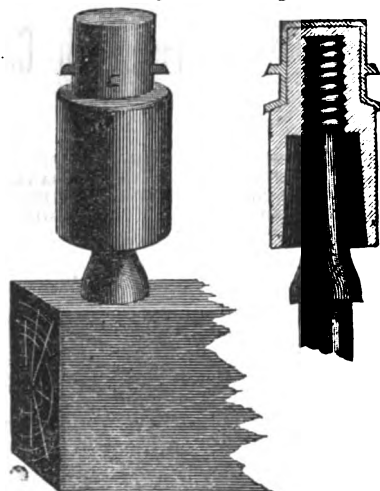
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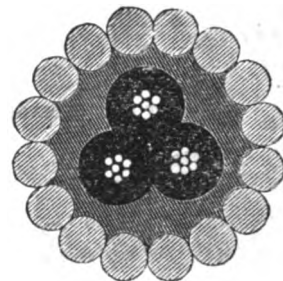
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 14.

NEW YORK, JULY 15, 1875.

WHOLE NO. 185.

## THE ELECTRIC LIGHT.

A modification of Geissler's tubes has recently been made for the purpose of illumination. It consists of a carbon and vacuum tube, of about one sixteenth of an inch internal diameter, wound in the form of a flattened spiral. The ends of the tube, in which the platinum wires are sealed, are about two inches in length, and half an inch in diameter. They are inclosed in a wooden case, leaving only the spiral exposed. When the discharge from the Ruhmkorff coil is transmitted through the platinum wires, the spiral becomes intensely luminous, exhibiting a brilliant white light. The quantity of light, however, is small, and it is of no practical value. It is only valuable as an experimental apparatus, or for scientific exhibitions.

Electricity of great tension and power is required for the electric light, and the easiest and least expensive mode of getting it for these experiments is by using a large Ruhmkorff coil, but the current from a battery of 200 cells would answer the same purpose. An electric light, without mechanism at the burner, can be made by placing two carbon points in hollow brass rods which are connected by wires with a galvanic battery. The rods slide in the heads of two glass pillars, so fixed to a stand as to admit of the points being placed at different distances. The wires for the battery poles being properly connected, the points are made to touch, and are then just separated, when the most dazzling light appears, rivaling the light of the sun in purity and splendor. The light is due chiefly to the intense whiteness of the tips of the carbon rods, and partly from an arch of flame extending from the one to the other. The positive pole is the brighter and the hotter, a fact which may be proved by intercepting the current, when the positive pole continues to appear red for some time after the negative pole has become dark. Any kind of carbon is well suited for the points. The more compact forms of charcoal answer very well, but baked carbon answers better. This is made as follows: The fine dust of coke and caking coal is put into a close iron mold, of the shape required for the carbon pencils, and exposed to the heat of a furnace. When taken out, the burnt mass is porous and unfit for use; but by repeatedly soaking it in thick syrup or gas tar, and reheating it, it acquires the necessary solidity and conducting power. The best carbon points, both for brilliancy and durability, are made, however, from the coke that is sublimed inside the retorts in the distillation of coal in gas works. During the maintenance of the light, a visible change takes place in the condition of the poles. The positive pole experiences a loss of matter; particles of carbon pass from it to the negative pole, some of them reaching it, and some being burnt by the oxygen of the air on the way. The same occurs, though to a much less extent, with the negative pole; so that, while the positive pole becomes hollowed out or blunt by its losses, the negative pole is kept pointed by the additional particles.

The wasting away, particularly of the positive pole, in a short time renders the distance between the poles too great for the passage of the current, and the light is suddenly extinguished, until again renewed by contact between the carbon points and their separation. If a powerful battery is used, the points may be removed one sixth or even one fifth of an inch before the circuit is broken. The transfer of matter between the poles is considered to ac-

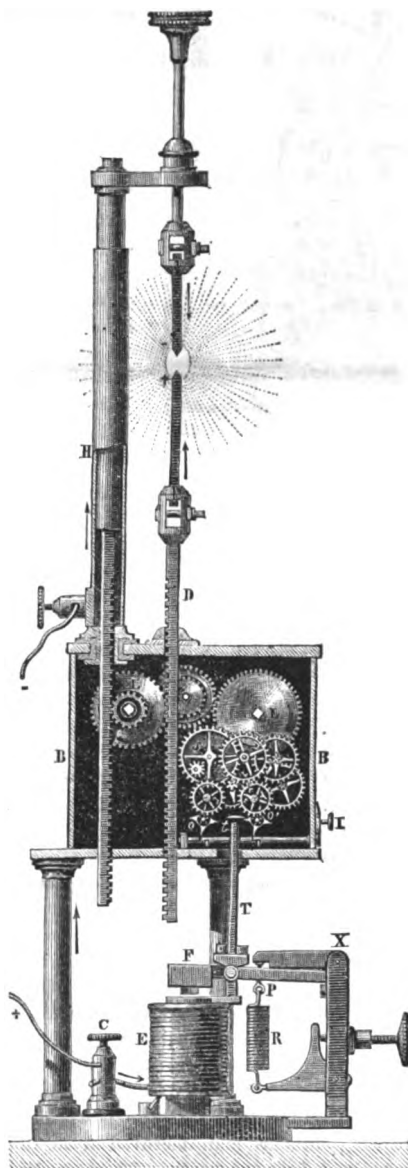


Figure 1.

count for the existence of the arch of flame, and the passage of the current through the air, as thereby a conducting medium extends between the poles. The light is not caused by the combustion of the carbon, but by its being brought into a state of incandescence. With a battery of fifty Grove or Bunsen

cells, a light of very great brilliancy is produced; but when very great power is to be obtained, as well as brilliancy, twice or thrice that number must be employed. Fifty cells give electricity sufficient tension to produce the light; and if more are used, they should be so arranged as to add to its strength and not its tension. Thus, if 150 cells be used, they should be arranged in three series, the positive poles of all three being joined to form one positive pole, and similarly with the negative poles. With a battery of fifty cells it is not necessary to point the rods, as the action of the electricity will do it. A battery of 50 large sized Grove or Bunsen cells will produce a light 34 times the power of the lime ball light, or one fifth as great as that of the sun.

Various arrangements have been invented for maintaining the steadiness of the electric light. The aim in all such is to keep the carbon points by some mechanical contrivance within such a distance of each other that the current can pass between them. Duboscq constructed an electric lamp of this description. In it, by aid partly of clockwork, the two points were made to travel toward each other at rates corresponding to those of their consumption, the positive pole in this way travelling faster than the negative.

Foucault's form of regulator, Fig. 1, has two systems of wheel work, one for bringing the carbons nearer together, and the other for moving them further apart. Fig. 1 represents the apparatus, with the omission of a few intermediate wheels. *L'* is a barrel driven by a spring inclosed within it, and driving several intermediate wheels which transmit its motion to fly, *a*. *L* is the second barrel, driven by a stronger spring, and driving in like manner the fly, *a'*. The racks which carry the carbons work with toothed wheels attached to the barrel, *L'*, the wheel for the positive carbon having double the diameter of the other. The current enters at the binding screw, *C*, traverses the coil of the electromagnet, *E*, and passes through the wheel work to the rack, *D*, which carries the positive carbon. From the positive carbon, it passes through the voltaic arc to the negative carbon, and thence, through the support, *H*, to the binding screw connected with the negative pole of the battery. When the armature, *F*, descends towards the magnet, the other arm of the lever, *F P*, is raised, and this movement is resisted by the spiral spring, *R*, which, however, is not attached to the lever in question, but to the end of any other lever, pressing on its upper side, and moveable about the point, *X*. The lower side of this lever is curved, so that its point of contact with the first lever changes, giving the spring greater or less leverage according to the strength of the current. In virtue of this arrangement, which is due to Robert Houdin, the armature, instead of being placed in one or the other of two positions, as in the ordinary forms of apparatus, has its position accurately regulated according to the strength of the current. The anchor, *T*, is rigidly connected with the lever, *F P*, and follows its oscillations. If the current becomes

too weak, the head, *t*, moves to the right, stops the fly, *o'*, and releases *o*, which, accordingly, revolves, and the carbons are moved forward. If the current becomes too strong, *o* is stopped, *o'* is released, and the carbons are drawn back. When the anchor, *T t*, is exactly vertical, both flies are arrested, and the carbons remain stationary. The curvature of the lever on which the spring acts being very slight, the oscillations of the armature and anchor are small, and very slight changes in the strength of the current and brilliancy of the light are immediately corrected.

Mr. Hart, of Edinburgh, Scotland, has invented a simple lamp, in which the weight of the rod, in which the carbon is fixed, supplies the place of the clockwork in the above described lamp of Foucault, and an electro-magnet lets it descend, or locks it, as the carbons are consumed.

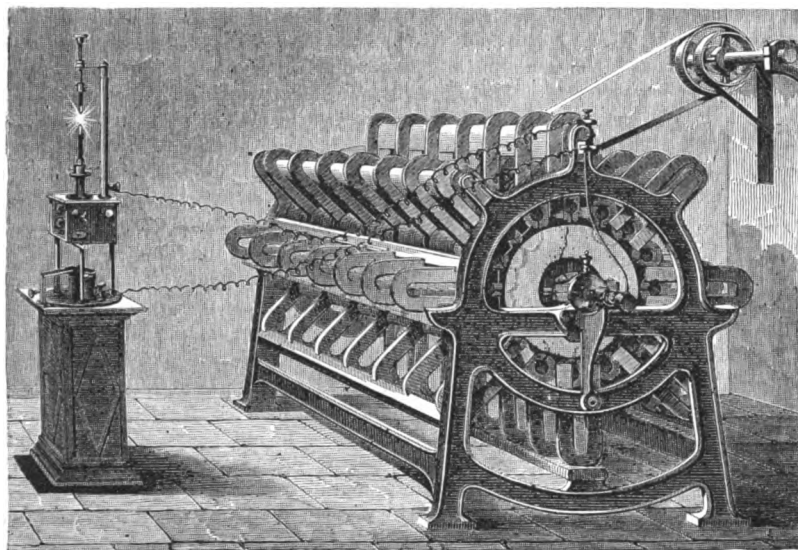


Figure 2.

The attempts which have been made to substitute the electric light for coal gas, in lighting up streets and public places, have hitherto proved unsuccessful. One element of imperfect success, in the practical success of the electric light, is due to the uncertainty of the light and the care attending its use. By contrivances like those we have described, the light may be continued for hours; but even then it is by no means steady, and the apparatus cannot be safely left without an attendant. It has, however, been used with excellent effect where a limited space had to be lighted up for a few nights, as well as for lighthouse illumination. Its power to penetrate fogs is immensely superior to that of oil light. Lighthouses at Dungeness and elsewhere have been lit with electric lights since 1863, the current being obtained from magneto-electric machines driven by steam engines. Fig. 2, represents the machine. It has eight rows of compound horseshoe magnets fixed symmetrically round a cast iron frame. They are so arranged that the opposite poles always succeed each other, both in each row and in each circular set. There are seven of these circular sets, with six intervening spaces. Six bronze wheels, mounted on one central axis, revolve in these intervals, the axis being driven by steam power transmitted by a pulley and belt. The speed of rotation is usually 350 revolutions of the axis per minute. Each of the six bronze wheels carries, at its circumference, sixteen coils, corresponding to the number of poles in each circular set. The core of each coil is a cleft tube of soft iron, the form having been found peculiarly favorable to rapid demagnetization. Each core has its magnetism reversed sixteen times in each revolution, by the influence of the sixteen successive

pairs of poles between which it passes; and the same number of currents, in alternately opposite directions, are generated in the coils. The coils can be connected in different ways, according as great electro-motive force or small resistance is required. The positive ends are connected with the axis of the machine, which thus serves as the positive electrode; and a concentric cylinder, well insulated from it, is employed at the negative electrode. Two of these machines are provided for each light, though only one is used, except in very foggy weather. These are driven by a six horse power steam engine, and all parts of the machinery, including boilers, are kept in duplicate. Coke is used for fuel, and about 56 lbs. are consumed each night. The machines are connected with the lamps by means of underground cables. Each lamp contains two pieces of carbon, about ten inches long by three-eighths of an inch

square. They are made from coke dust, and are consumed at the rate of thirty-four inches per night for each light, at a cost of two cents per inch, exclusive of waste or breakage. They are moved toward each other by means of automatic apparatus; and the only danger of irregularity of the lights arises from the presence of foreign matter in the carbons. This, however, is instantly corrected. The annual cost of

the electric light at Dungeness is about \$4,000.

The most powerful light which has yet been constructed is that of the flashing electric light at Souter Point, England, three miles below the mouth of the Tyne, the condensed beam of which is equal to 800,000 candles.

There are two electric lights situated on the South Foreland, three miles from Dover. These are 1,000 feet apart, one being 372 and the other 275 feet above the sea level. The rear light is utilized, by means of totally reflecting prisms, to reinforce the front light, which is required over a range of 180° only. Both lights are fixed. The power of each beam is estimated as equal to 180,000 candles; and when observed from Dover, a distance of three miles, they throw a very distinct shadow from objects on the pier.

In addition to the above mentioned electric lights, there are in France two fixed lights at La Héve, and a revolving light at Cape Grisnez; in Egypt, a revolving light at Port Said; and in Russia, a fixed light at Odessa. The plan in operation at La Héve is very similar to that of South Foreland. Six-plate magnets, of a power of 145 to 155 lbs., are used, and some three-plate magnets, with the power of 75 lbs. The carbon points are manufactured from the residue contained in gas retorts. They are 10 inches long, and from one-third to one-half an inch thick. The optical apparatus is about 6 foot in diameter, and it sends the light tangentially to the surface of the sea. Many accidents, however, have occurred at La Héve; in one instance the lights were extinguished for a space of an hour. Much trouble has been experienced with the machinery, which is now placed in a more satisfactory condition. Of the cost of this

light, we have no data later than 1869; but it appears that the average of that and the four previous years was \$3,215 34, the total number of hours of illumination averaging 4,135 annually. The machines are started 10 minutes before the time of illumination, so that the currents may be well established, and the light is exhibited 15 minutes after sunset, and extinguished 15 minutes before sunrise. Double lights are produced whenever the fog is so dense that the keepers cannot see the beacon lights on the north pier at Havre, and this occurs about eighty hours every year.

The disadvantages attending a general use of electricity are due chiefly to the large amount of space required for the steam engines and the magneto-electric machinery, for storing coal, coke, etc., and for collecting and preserving the water for the engines. The repairs needed require also special workmen, not usually found in the vicinity of lighthouses. Consequently the electric light can at present be made available only in certain localities. It would be disadvantageous in light-houses at sea, or those which are distant from centres of population. But where there is plenty of space, and where cities are within easy reach, their substitution for other lights is strongly approved by mariners.

ON THE DEPTH AND SUPERPOSITION OF MAGNETIZED LAYERS IN STEEL.—*J. Jamin*.—On December 30, 1872, and later, the author explained certain effects of inverse and direct currents of different intensities upon the same magnet by assuming that the magnetism only penetrates to a limited depth according to the strength of the current, and that the successive actions of the two currents (the first energetic and direct, the second weak and inverse) superpose two contrary magnetizations, the one deep the other superficial. We only perceive the difference, As this conjecture has been contested, the following experiments, apparently of a decisive character were undertaken. Into a steel tube, closed by two steel screw stoppers, was introduced a steel cylinder. The whole was magnetized in a coil by a current whose strength was progressively increased. Whilst weak it acted only on the tube, leaving the cylinder free as before; but with a determined force the cylinder became slightly magnetized, the magnetism increasing with the current strength until it attained the same power as that of the tube. To confirm this, the cylinder was first saturated alone with a direct current, and then introduced into the tube; then the whole concern was submitted (in a coil) to an intense and gradually increasing current. Whilst the current was weak, the cylinder preserved all its magnetism; then, as the current strengthened, the cylinder slowly lost it, afterwards taking another of an inverse nature. There is always a moment in which the whole apparatus possesses no apparent magnetism, and cannot be magnetized by an inverse current, whilst it is energetically magnetized by the direct current which has magnetized the cylinder. But if the cylinder and tube together are thus neutral, it is not in a natural condition; for on separating the two portions, they have different magnetisms—direct on the cylinder, inverse on the tube; they neutralize one another by superposition. This is what takes place in a single piece of steel when submitted to two contrary magnetizations. More direct methods of proof were instituted, consisting in dissolving the exterior parts of the magnets in diluted sulphuric acid. The results M. Jamin considers to be also conclusive, though the carrying out of the experiments was attended with great difficulties.



## SUPPLYING A NUMBER OF TELEGRAPH LINES FROM ONE BATTERY.

The method, formerly much in use, of supplying or working a number of telegraph lines from the same battery, depends upon the laws governing the distribution of electricity in branch circuits. We may, for instance, attach to the battery Z K, at the point A (see fig. 1), two separate circuits, the resistances of which, including that of the instrument included in them, are represented by  $l_1$  and  $l_2$ . These lines are connected to the earth at  $E_1$  and  $E_2$ .

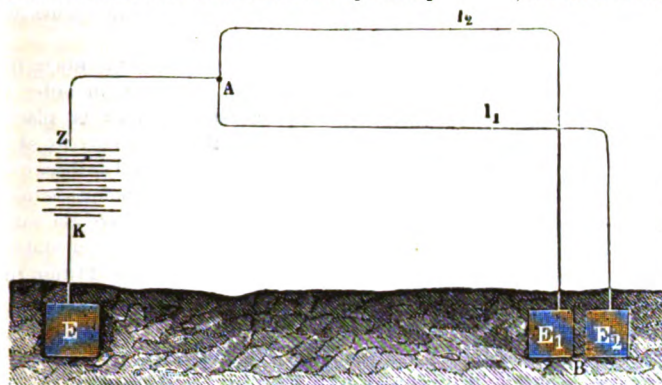


Figure 1.

It is evident that this is in fact, precisely the same arrangement of circuits as that previously considered on page 195 and in fig. 6. The current going out from the point A divides into two branches, which reunite at a common point B (the earth), and the reunited current flows back to E and K, the earth playing the part of a conductor.

If we represent by  $S$  the strength of the undivided current in A Z K E B, and by  $W$  the resistance of the battery, and the current is supposed to pass simultaneously through both the circuits  $l_1$  and  $l_2$ , then,

$$S = \frac{E}{W + \frac{l_1 l_2}{l_1 + l_2}}$$

Now, assuming that the resistance  $W$  of the battery in comparison with the sum of the resistances of all the branch conductors,

$$\frac{l_1 l_2}{l_1 + l_2}$$

is infinitely small, then we obtain for the aggregate strength of current in Z A :

$$S = \frac{E}{\frac{l_1 l_2}{l_1 + l_2}} \quad (a)$$

or,

$$E = S \cdot \frac{l_1 l_2}{l_1 + l_2} \quad (b)$$

Likewise, upon the same hypothesis, that the battery is closed at the same time through both lines  $l_1$  and  $l_2$ , the strength of current  $S_1$  in the branch  $l_1$ , will be

$$S_1 = S \cdot \frac{l_2}{l_1 + l_2} \quad (c)$$

On the other hand, when the current of battery Z K is allowed to pass exclusively through line  $l_1$ , then the strength of current  $s_1$ , in line  $l_1$ , is

$$s_1 = \frac{E}{W + l_1}$$

or, because  $W$  in this case = 0,

$$s_1 = \frac{E}{l_1}$$

or, when we substitute the value of  $E$  from (b) in the latter equation,

$$s_1 = S \cdot \frac{l_1 l_2}{l_1(l_1 + l_2)} = S \cdot \frac{l_2}{l_1 + l_2}$$

therefore, by comparing the latter equation with the equation (c),

$$S_1 = s_1.$$

That is to say, when a number of lines are attached to one common battery, the internal resistance of the latter being infinitely small in comparison with that of the several lines or branch circuits, the strength of current in each circuit will be the same as if no other circuit was attached to the battery.

Under such circumstances, when several telegraph lines are connected with one common battery, it is immaterial whether one line alone is worked or whether several lines are operated at the same time. Although this fact may at first sight appear very singular, the explanation is, that while a single line is being supplied from a battery and a second and third line are connected, the total amount of current flowing from the battery divides itself between the three lines, and in consequence of this the proportion of the total current traversing the former circuit becomes smaller than it was previously, but by connecting the two new lines the aggregate sectional area of conductor for discharging the battery increases, and so also does the strength of current in the same proportion, consequently the loss which arises from the division of the current is exactly equalled by the gain resulting from the increased strength of current.

It was upon this principle that formerly a large number of telegraph lines were worked from a single Grove battery. The internal resistance of this battery is so small in proportion to that of a long telegraph line as to be almost inappreciable. For various reasons it has been found preferable to use batteries of greater internal resistance, and work but one or two wires from each one, and this latter arrangement is now generally adopted.

We have already shown that we derive the maximum strength of current from a given battery, when its internal resistance is equal to the resistance of the remainder of the circuit. Hence, when the latter is very great, as in the case of long telegraph lines, the internal resistance of the battery may also be considerable without materially affecting the strength of the current upon the line. For this reason almost all kinds of batteries, even the inconstant ones, are more or less adapted for working telegraph lines, and the longer the line, that is to say, the greater the resistance of the circuit, the better will such batteries answer the purpose. This, however, is the case only when each telegraph line has its separate battery. The result is very different as soon as the same battery is employed to work several lines; for in this case the resistance of the battery becomes an important part of the total resistance and should therefore be limited to the smallest possible amount, for, as we have before stated, each line, whether one or more lines are working, should receive a current of equal strength. It follows from these considerations that the usual practice of increasing the number of elements in a common battery with the number of lines to be worked is entirely wrong, because the total resistance of the battery is increased, and consequently the difference in the strength of current of each single line when

closed by itself, or simultaneously with the others, increases also. For this reason inconstant elements (which have considerable resistance on account of the polarization of their plates), or very small elements, are not well adapted for a common or general battery. Assuming that the internal resistance of the battery may be neglected in comparison with the joint resistance of the several branch lines, then each line will, under all circumstances, receive a current of the same strength as if the battery were closed through that line alone. As the number of elements, or the strength of the battery must necessarily be sufficient for the longest line attached to it, the strength of current in the shorter lines, when the difference of length is considerable, will be too great for the instruments in circuit. In order to reduce the strength of the current in the shorter lines to the required amount, we must either insert artificial resistances or else the unequal lines must not all be attached to the same point of the common battery. The shorter lines may preferably be attached to the battery in such a manner, that the number of elements by which it is worked have the same relation to the length of the line as the whole number of elements have to the longest line.

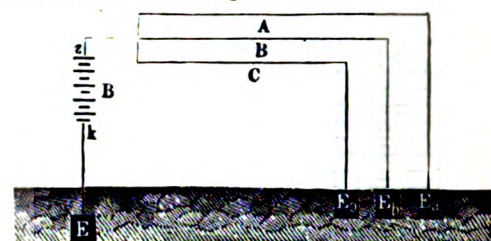


Figure 2.

If we suppose that to a pole  $z$  of battery B (fig. 2), whose electromotive force of  $n$  elements is  $n \times e$  and whose internal resistance is  $n \times w$ , are attached three lines, whose resistances are indicated by ABC. When the battery is closed by one of these lines, the strength of current, according to Ohm's laws, is :

$$\left. \begin{aligned} \text{for A} \dots s_1 &= \frac{n e}{n w + A} \\ \text{" B} \dots s_2 &= \frac{n e}{n w + B} \\ \text{" C} \dots s_3 &= \frac{n e}{n w + C} \end{aligned} \right\} \dots \dots \dots (1)$$

If the three lines are closed simultaneously, so that the current traverses each line at the same time, the joint resistance of the three lines is

$$\frac{A B C}{A B + B C + A C}$$

and the current strength  $S$  in the undivided wire is :

$$S = \frac{n e}{n w + \frac{A B C}{A B + B C + A C}}$$

or

$$S = \frac{n e (A B + B C + A C)}{n w (A B + B C + A C) + A B C}$$

whence the strength of current in each single branch is

$$\left. \begin{aligned} \text{in A} \dots s' &= \frac{n e B C}{n w (A B + B C + A C) + A B C} \\ \text{in B} \dots s'' &= \frac{n e A C}{n w (A B + B C + A C) + A B C} \\ \text{in C} \dots s''' &= \frac{n e A B}{n w (A B + B C + A C) + A B C} \end{aligned} \right\} \dots \dots (2)$$



If we compare equations (1) and (2) we find the difference of the current strengths in each single line, when the current of the battery traverses the latter alone and the three lines simultaneously. This difference becomes less as  $w$  is made less, that is to say, the smaller the resistance of the battery, the less this difference is, and it would disappear entirely if we could make  $w = 0$ ; in this case the strengths of currents given by equations (1) and (2) would be equal, that is,  $s_1 = s'$ ,  $s_2 = s''$ ,  $s_3 = s'''$ .

If the resistances A B C in the arrangement mentioned herebefore (fig. 2) vary much, the current differences,  $s_1 - s'$ ,  $s_2 - s''$ ,  $s_3 - s'''$ , which we obtain when a line alone, or when all the lines are closed at the same time, become larger in the respective lines, and as each line requires for the battery only a strength of current proportionate to its resistance, lines differing in resistance, as we have said before, need not be joined to the same pole of the battery. The shorter lines ought rather to be attached to the battery in such a manner that the number of elements which come into operation for the respective line stand in the same relation to the length of the line as the whole number of elements to the longest line.

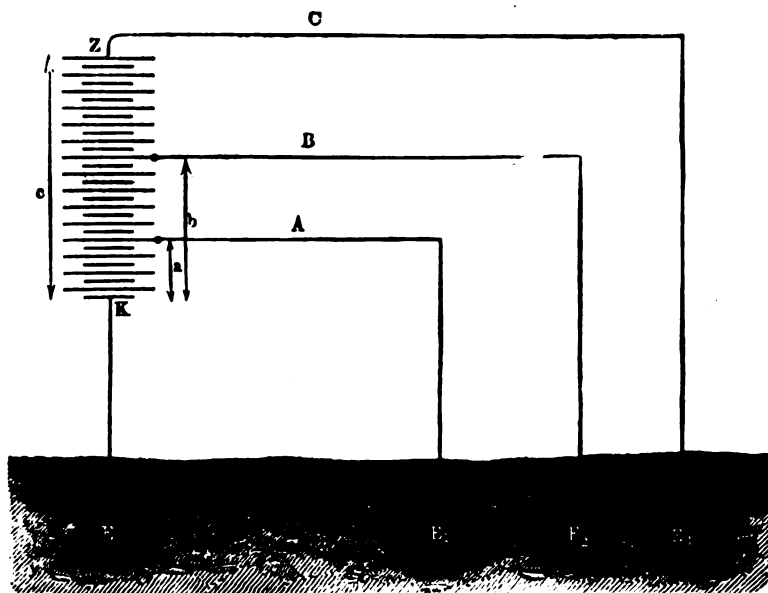


Figure 3.

Hence, when, as in fig. 3, three lines A B C of unequal resistance are to be worked from one battery Z K, the lines should be connected with the battery in such a manner that the relation is

$$\frac{A}{a} = \frac{B}{b} = \frac{C}{c}$$

where, as previously, the resistances of the single lines are indicated by A B C, and the number of elements by a b c, counted from the pole connected with the earth.

Now, if the resistance of an element is  $w$  and its electromotive force is  $e$ , the strength of current when each line is closed in succession is

$$\begin{aligned} \text{in A} \dots S_1 &= \frac{ea}{wa + A} = \frac{e}{w + \frac{A}{a}} \\ \text{in B} \dots S_2 &= \frac{eb}{wb + B} = \frac{e}{w + \frac{B}{b}} \\ \text{in C} \dots S_3 &= \frac{ec}{wc + C} = \frac{e}{w + \frac{C}{c}} \end{aligned} \quad (3)$$

and as the relation of the number of elements in the battery to the resistance of lines is everywhere

$$\left( \frac{A}{a} = \frac{B}{b} = \frac{C}{c} \right) \text{ there circulates, relatively}$$

considered, an equally strong current in each line. When we may assume that the resistance of the battery and that of the earth are equal to nought, the strength of current in each line closed separately is no greater than it would be where all three lines closed simultaneously.

It follows from these considerations that a battery which serves to work several lines should have its internal resistance made as small as possible, and that the separate lines in the order of their respective resistances should be connected with a proportionate number of elements, so as to limit the differences of currents to so small an amount that they may be neglected in practice.

It remains to be mentioned that on lines subject to heavy escapes the use of one battery to supply several circuits has frequently proved unsuccessful and has given rise to erroneous opinions. In consequence of the escapes by partial ground connection, the joint resistance of the several circuits becomes

greatly reduced, and when a line on which there is considerable escape in proportion to its resistance, is attached to a battery supplying other wires, the proportion of the division of current is disturbed in these wires, especially when the resistance of the affected wire is small. The difference of current in the good wires will vary in the same proportion as the escapes on the bad one.

When all the wires are not affected with escapes of nearly equal value in proportion to their length, the poorly insulated ones should be worked by separate batteries.

It has already been shown that where several lines are worked from one battery, the strength of current in each line may also be brought nearly to correspond with its resistance by inserting artificial resistances, and attaching the different lines to the same pole of the battery.

Suppose in fig. 4 from point B, which is attached to the zinc pole of the battery Z K, of the central station A, five lines branches off to stations  $S_1, S_2, S_3, S_4$  and  $S_5$ . Let  $n$  be the number of elements in the battery;  $w$  the resistance of a single element,  $e$  its electromotive force, and  $r$  the resistance of the wire A B; also let  $l_1, l_2, l_3, l_4$  and  $l_5$  represent the respective resistances of the derived circuits branching off from B, including as well the resistance of the instrument in circuit.

We, therefore, have for the joint resistance of the branch line from B:

$$Z = \frac{l_1 l_2 l_3 l_4 l_5}{l_1 l_2 l_3 l_4 + l_1 l_2 l_3 l_5 + l_1 l_2 l_3 l_4 + l_1 l_2 l_4 l_5 + l_1 l_3 l_4 l_5 + l_2 l_3 l_4 l_5}$$

and hence the total resistance  $W$  of the entire circuit of the battery

$$W = nw + r + Z,$$

and the strength  $S$  of the current in the undivided wire A B,

$$S = \frac{ne}{W} = \frac{ne}{nw + r + Z}$$

Upon the same principle we obtain for the strengths  $s_1, s_2, s_3, s_4, s_5$ , of the currents traversing the different lines to the stations  $S_1, S_2, S_3, S_4$ , and  $S_5$ .

$$s_1 = S \cdot \frac{l_2 l_3 l_4 l_5}{l_1 l_2 l_3 l_4 + l_1 l_2 l_3 l_5 + l_1 l_2 l_3 l_4 + l_1 l_2 l_4 l_5 + l_1 l_3 l_4 l_5 + l_2 l_3 l_4 l_5}$$

$$s_2 = S \cdot \frac{l_1 l_3 l_4 l_5}{l_1 l_2 l_3 l_4 + l_1 l_2 l_3 l_5 + l_1 l_2 l_3 l_4 + l_1 l_2 l_4 l_5 + l_1 l_3 l_4 l_5 + l_2 l_3 l_4 l_5}$$

and in like manner we may ascertain the values for  $l_3, l_4$ , and  $l_5$ .

We at once see that the strengths of currents in the different lines are not equal, and that, in order to make them so, artificial resistances must be placed in the shorter circuits. As the main current at B divides itself in five branch currents, and as these currents are to have the same strength (it being assumed that the instruments at each station have the same resistance), the artificial resistance for each station must be of such an amount that by its addition the resistances  $l_1 \dots l_5$  become equal to each other, when it is obvious that

$$s_1 = s_2 = s_3 = s_4 = s_5.$$

The longest line, for instance,  $S_5$ , does not need any additional resistance. If we indicate the resistance of the instruments by  $a$ , the artificial resistances to be inserted at  $S_1 \dots S_4$  by  $x_1 \dots x_4$ , the resistances of the sections  $BS_1, BS_2, \dots$  etc., less the resistance of the apparatus by  $L_1, L_2$ , etc., then,

$$\begin{aligned} l_1 &= l_2 = l_3 = l_4 = l_5 \\ \text{as } \dots l_1 &= L_1 + a + x_1 \\ l_2 &= L_2 + a + x_2 \\ l_3 &= L_3 + a + x_3 \\ l_4 &= L_4 + a + x_4 \\ l_5 &= L_5 + a \end{aligned}$$

From which we may easily calculate the artificial to be inserted at each station, namely,

$$x_1 = L_5 - L_1; \quad x_2 = L_5 - L_2;$$

and in like manner for the others.

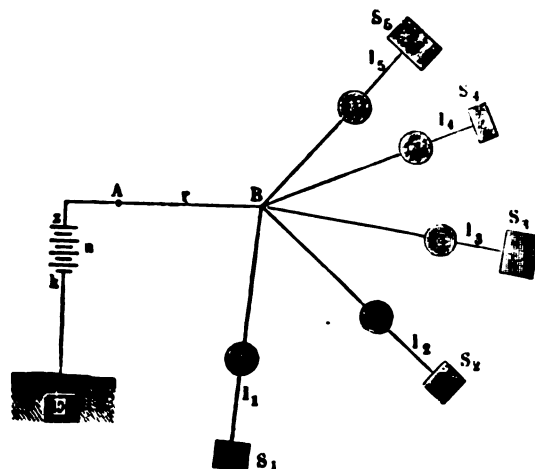


Figure 4.

The remaining formulæ for the resistance  $Z$  of the branch lines, as well as for that of the whole resistance  $W$  of the circuit then become

$$Z = \frac{l_5}{5}; \quad \text{and } W = n \cdot w + r + \frac{l_5}{5}.$$

By substituting the values the above expression, we obtain for  $S$ :

$$S = \frac{ne}{nw + r + \frac{l_5}{5}} \quad (1)$$

also,

$$s_1 = s_2 = s_3 = s_4 = s_5 = \frac{S}{5},$$

or,

$$s_1 = s_2 = s_3 = s_4 = s_5 = \frac{ne}{5(nw + r) + l_5} \quad (2)$$

Now, in order to determine how many elements should be used to work the instruments in the branch circuits, when the currents are alike in all, we must find by observation, what strength of current, under certain conditions, is required to work them. For instance, we know that under ordinary circumstances, a Daniell's battery of 40 elements is sufficient to work a relay of 150 Ohms on a line of 1,500 Ohms' resistance. The strength  $S$ , of such a current, when  $e$  and  $w$  retain their former value, is

$$S_1 = \frac{40 \cdot e}{40 \cdot w + 1,650}$$

If now we call the resistance of a Daniell's element two ohms, the current required to work the instrument is,

$$S_1 = \frac{e}{43.25} \quad (3)$$

Adopting this value of  $S$  as the strength of current required in each of the five circuits  $S_1, S_2, S_3, S_4, S_5$ , we obtain from the equations (2) and (3):

$$\frac{ne}{5(nw + r) + l_5} = \frac{e}{43.25}$$

hence,

$$n(43.25 - 5w) = 5r + l_5$$

or, when  $w = 2$  Ohms,

$$n = \frac{5r + l_5}{33.25} \quad (4)$$

Now, suppose the resistance of the line A B is 500 ohms, and the line B  $S_1$ , 1,000 ohms, then, as the resistance of the instrument is 150 ohms, we have,

$$r = 500, \\ l_5 = 1,150;$$

by substituting these value in equation (4) we finally obtain,

$$n = \frac{5 \times 500 + 1,150}{33.25} = 109.77,$$

or, in round numbers,

$$n = 110.$$

Whence it follows, when we have made the resistances  $l_1 \dots l_5$  equal to each other by inserting resistances at the different stations, and each is equal to  $l_5 = 1,150$  Ohms; that a battery of 110 Daniell's elements at station A will supply simultaneously to each of the lines B  $S_1 \dots B S_5$  currents of equal strength; each of which is strong enough to work the relays in the respective circuits.

#### ANGLO-AMERICAN TELEGRAPH.

The following are the traffic receipts of this company from messages at the reduced tariff of 2s. per word for the week ending on June 25:

Friday	June 19	£1,500
Saturday	" 20	1,340
Sunday	" 21	350
Monday	" 22	1,250
Tuesday	" 23	1,460
Wednesday	" 24	1,540
Thursday	" 25	1,350

The average daily receipts in June last year, with the messages at the rate of 4s. per word, was £1,959.

#### THE GALVANIC BATTERY.

In respect to the economical application of electricity, no subject is so important as the relative merits of different forms of batteries. For illuminating purposes and lecture demonstrations we have hitherto had to rely upon the Bunsen or Grove battery; but, during the siege of Paris, a form of bichromate of potash battery, known as the Chutaux battery, was frequently employed to yield the electric light used on the ramparts. Count Moncel gives a full account of the different forms of the Chutaux battery, and furnishes some interesting data for the comparison of the Chutaux and Bunsen battery when giving the electric light. The following results were obtained from the two batteries, each being composed of 48 cells, and each working for two hours:

##### BUNSEN'S BATTERY.

Light equal to	At beginning.	End.	Mean.	Surface of zinc employed.
109 Carcel lamps.	66	87.5		318.61 square inches.

##### CHUTAUZ BATTERY.

Light equal to	At beginning.	End.	Mean.	Surface of zinc employed.
132	63	97.5		92.88 square inches.

In working each of these batteries for half an hour successively, the following results were found:

	BUNSEN.	CHUTAUZ.
1st period of half an hour....	109 Carcel lamps.	132 lamps.
2d period of half an hour. {	Beginning 134 lamps.	128 "
	End 137 "	100 "
3d period of half an hour.. {	Beginning 106 "	80 "
	End 97 "	51 "
4th period of half an hour.....	End 66 "	63 "

According to these figures the bichromate of potash battery flags much quicker than the nitric acid battery, a fact which evidently depends on the polarization of its plates, to which it is always liable. It is, however, more economical.

One rather important advantage of these batteries is that they can kept in a closed place without giving out any odor or unhealthy emanation; besides this, the liquid evaporates slowly. The author had also been able to verify the statement that, after a battery had been charged for more than a year, and then left alone, it had hardly lost anything of its power. The relative consumption of zinc and acid and the comparative cost of working of the whole battery are not given; but so far as the foregoing data are concerned, the Chutaux evidently promises extremely well. So says the *Telegraphic Journal*. For lecture purposes an electric light is rarely wanted for more than half an hour, the great desideratum being a rapid means of charging and discharging the battery. In this respect nothing could be better than the Chutaux; being a single fluid battery, the plates can be raised and lowered easily and rapidly. One of the characteristics of this bichromate battery is the constant percolation of fresh solution through the battery; by this means a good deal of the bad effect of polarization is got rid of. Here is the composition of the solution of his batteries, recommended by M. Chutaux; Water, 1,500 grains; bichromate of potash, 100 grains; bisulphate of mercury, 50 grains; sulphuric acid, 200 grains. The electromotive force of such a cell is at first more than twice that of a Daniell cell, but in duration it cannot, of course, be favorably compared.

The cost of working the Chutaux, Count du Moncel finds to be about 35 cents, which he states is less than that of a Daniell cell, the advantage being that in the Chutaux an electro-motive force of nearly double is obtained, and an internal resistance less than half that of the Daniell, besides other obvious advantages noticeable in the working of the two forms. A battery of 24 Chutaux cells, according to our author, can furnish a rarely brilliant electric light at a cost of about 15 cents per hour.

#### SAVED BY LIGHTNING.

SINCE it appears tolerably evident that a St. Louis scientist has hit the nail on the head in his weather prognostications for the Summer of 1875, and that there will be wind-storms and rain-storms in abundance, we may settle down to the probable conviction that it will not be a cholera season in this country. This, of course, if the sanitary condition of cities is kept anything near what it should be. Electricity in the air appears to be bad for the cholera germs, and *apropos* of this fact, may be related a little incident, true in every particular, and never yet in print. During the great cholera season of 1849, a man living in Mooretown, Canada—a small place opposite St. Clair, on the American side of the St. Clair River—was one of the victims of the plague. He was taken sick with cholera, suffered terribly, and finally, as was supposed, died. The body was prepared for the grave, and laid out upon bed, awaiting a coffin and funeral ceremonies. In the interval a violent thunder storm came up suddenly, the shocks were terrific and followed each other in rapid succession. At length came a blinding flash, followed by a deafening peal of thunder, and the house in which the body of the victim of cholera lay was struck by lightning, the body itself apparently receiving a portion of the electric charge. What followed was most astonishing. The supposed dead man showed signs of life. Ever attention was paid him, all possible medical assistance afforded, and the final result was that he recovered. He still lives in Mooretown, and the statements of this incident can be readily substantiated. The hero of this affair is perhaps the only man existing who can say that he owes his being to a stroke of lightning. Electricity saved his life as it is said to have saved the lives of drowned men. There may be a hint in the affair for the physicians. There is evidently no sympathy between cholera and lightning. —*St. Louis Republican*.

#### ELECTRIC CONDUCTIVITY OF CARBON.

At a recent meeting of the London Physical Society, Mr. Bauerman, F. G. S., described and illustrated a very simple method for ascertaining the electric conductivity of various forms of carbon. The method, which was originally devised by Dr. von Kobell, consists in holding a fragment of the substance to be tested with a strip of zinc bent in a U-form, and immersing it in a solution of copper sulphate. In the case of a bad conductor, a deposit of copper takes place solely on the surface of the zinc, but when a good conductor is employed, a zinc carbon couple is formed, and a deposit takes place on the surface of the carbon. Numerous specimens were exhibited which showed that the conducting power is greatest in coal which has been subjected to a great degree of heat, and the lowest temperature at which this change takes place, appears, in the case of anthracite, to be between the melting points of zinc and silver. Such experiments appear to be specially important as giving a clue to the temperature at which anthracite metamorphism has been effected by the intrusion of igneous rock.

#### ON THE MAGNETIZING FUNCTION OF TEMPERED STEEL.

—*M. Bouty*.—The magnetic movement of a needle may always be considered the product of two factors, one of which expresses the quantity of magnetism in the needle, or, if preferred, the strength of each pole whilst the other factor is equal to the distance of the two poles. The determination separately of these two distinct elements, and the study of the variation of each of them under changed magnetizing conditions, occupied by Mr. Bouty some time, and his investigations are still incomplete.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, July 15, 1875.

To all offices in W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Bellevue, Ala., closed.  
Aptos, Cala., reopened.  
Los Banos, Cala., closed.  
Hereafter the "tariff for other lines" from Visalia to Kingston, Cala., will be 60-30 instead of 30-10, as at present.  
The P. O. A. of Niwot, Col. is Modoc P. O.  
Forks of Clear Creek, Col., reopened.  
New Chicago, Kas., changed to Chanute.  
Messages taken for Farmingdale and Pittston, Me., are delivered from Gardiner, Me. (charges for delivery 25 cents per message to each).  
In messages for Mexico, addressed to one party in care of another, only the name of the first and the name of the office are sent free, all other words in the address are to be charged for—for example:

Jose Maria Garcia.  
Care of Dr. Pedro Garcia,  
Calle Numero 24,  
Mexico City.

The words "Care of Dr. Pedro Garcia, Calle Numero 24," are counted as 9 extra words.

Oak Bluffs, Mass., is now a W. U. Office, tariff, 25 cents more than Wood's Hole, check direct.

Carp River, Mich., closed.  
The new office given as Pittabawassa, Mich., in last JOURNAL, should read Tittabawassa.

Morton, Miss., closed.  
Winchester, Miss., closed.  
Keytesville, Mo., reopened, square, 418.

Offices are hereby notified that half rate messages should not be taken for any office in, or east of New Brunswick and Nova Scotia, whether on "this line" or "other lines," except St. John, N. B., and Halifax, N. S.

Messages taken for Beach Haven, N. J., during the summer season are delivered from Tuckerton, N. J., without extra charge for delivery.

Guyard, N. Y., reopened as a W. U. office, square 46.  
Fremont, N. C., closed.  
Halifax, N. C., closed.

In JOURNAL of June 15th, 1875, the name of Carroll, Ottawa, Co., O., Office, was changed incorrectly to La Carue. It should have read La Carne.

Business for Hatfield, Pa., will hereafter be checked direct.  
Harbor Creek, Pa., closed.  
Hopbottom, Pa., changed to Foster.  
Barvers, Pa., closed.

## SUMMER OFFICES REOPENED.

Lebanon Springs, N. Y.  
Crescon Springs, Pa.  
Watch Hill, R. I.  
Bon Aqua Station, Tenn.  
Bath Alum Springs, Va.  
Healing Springs, Va.  
Hot Springs, Va.  
Montgomery White Sulphur Springs, Va.  
Yellow Sulphur Springs, Va.  
Warm Springs, Va.

The office at Jordan Alum Springs, Va., will not be reopened this season, business should be sent and checked to Rock-bridge Alum Springs, from which office messages are delivered.

## NEW OFFICES.

304 Brown's Station, Ala.  
294 Saluria, Ala.  
\* Conway, Ark. 30 2 from Little Rock.  
\* Morrilton, Ark. 40 3 " "  
\* Russellville, " 40 3 " "  
296 Danforth, Ill.  
337 Stonington, Ill.  
\* Counshatta, La., 50 4 from Minden.  
16 Phillips, Me.  
16 Strong, Me.  
513 Steele City, Neb.  
192 Albany, Athens Co., O., P. O., Lee.  
\* Chesapeake, Ont.  
\* Fournier, "

\* Pendleton, Ont.  
\* St. Helens, "  
\* Thamesford, "  
58 Foster, Pa., (formerly Hopbottom.)  
59 Hartsville, Pa.  
59 Telford, Pa.  
\* Bergerville, Que.  
\* Cacouna Sta., J. C. R. R. Que.  
192 Hartford City, W. Va., check Pomeroy, O.  
192 Mason City, W. Va., Check Pomeroy, O.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, July 9, 1875.

The name of the money order office heretofore known as Ausable, Michigan, has been changed to Oscoda, Michigan.

Portsmouth, O., has been discontinued as a money order office.

GEO. H. MUMFORD,  
Vice-President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

New York, July 10, 1875.

## ASSESSMENT No. 76.

13, 19, 21, 26, 31, 51 61, 70, 75, 80, 84, 89, 93, 97, 112, 114,  
120, 129, 134, 154, 156, 158, 160, 164, 171, 206, 218, 227, 232,  
240, 244, 245, 248, 252, 257, 274, 278, 279, 281, 282, 283, 285,  
316, 319, 341, 342, 350, 353, 356, 357, 360, 361, 362, 364, 366,  
378, 380, 382, 405, 406, 411, 412, 413, 425, 456, 463, 478, 481,  
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579, 584, 590, 594, 600, 618, 648, 662, 663, 664, 665, 669, 672,  
678, 680, 694, 712, 723, 724, 725, 728, 730, 733, 769, 772, 780,  
787, 791, 803, 813, 815, 821, 823, 832, 848, 869, 870, 876, 897,  
899, 904, 905, 920, 927, 929, 931, 932, 934, 938, 939, 942, 949,  
954, 957, 959, 963, 964, 978, 979, 992, 995, 1011, 1028, 1030,  
1031, 1033, 1034, 1046, 1060, 1065, 1057, 1058, 1063, 1069, 1072,  
1080, 1100, 1101, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113,  
1115, 1117, 1119, 1120, 1122, 1123, 1125, 1131, 1148, 1149, 1152,  
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1412, 1415, 1421, 1428, 1438, 1453, 1454, 1455, 1456, 1457, 1458,  
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1771, 1789, 1795, 1796, 1797, 1802, 1804, 1813, 1817, 1818, 1823,  
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1863, 1874, 1877, 1881, 1889, 1895, 1911, 1913, 1914, 1934, 1943,  
1958, 1973, 1978, 1992, 1993, 1995, 1999, 2001, 2004, 2007, 2010,  
2012, 2022, 2028, 2035, 2038, 2063, 2065, 2066, 2092, 2095, 2108,  
2110, 2112, 2119, 2123, 2125, 2131, 2137, 2143, 2145, 2156, 2157,  
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2340, 2346, 2350, 2357, 2361, 2366, 2368, 2369, 2374, 2382, 2397,  
2399, 2401, 2415, 2422, 2423, 2429.

## ASSESSMENT No. 75.

27, 98, 237, 238, 242, 246, 258, 451, 453, 455, 457, 804, 871,  
908, 1715, 1716, 1718, 1731, 1786, 1941, 1974, 1976, 2000, 2037,  
2120, 2177, 2266, 2290, 2323, 2328, 2353.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

## A TELEGRAPHER MURDERED.

MR. JOHN TREVOR, of Rochester, N. Y., for some years station repairer for the Western Union Telegraph Company, but of late acting as watchman for one of the banks of that city, was on Friday night, July 2d, shot by a burglar he was endeavoring to arrest. He has since died leaving a wife and small family. His death has created a widespread sympathy in the community where he was well known and esteemed. He was a member of the Telegraphers Mutual Benefit Association.

## NEW TELEGRAPH ENTERPRISE.

From the Chicago Tribune.

SAN FRANCISCO, July 7.—There has been incorporated here to-day an association of our principal capitalists under the name of the National Telegraph Company, for the purpose of, as stated in their articles of incorporation, "the construction, conduct and maintenance of telegraph lines between the cities of New York and San Francisco, and between said cities and all other principal cities and towns in the United States and to the Territories thereof, and in the Dominion of Canada, and to connect by said telegraph lines said principal cities and towns with each other." The estimated length of the line is 75,000 miles. The capital is \$25,000,000, of which is \$7,500,000 has been subscribed, and 10 per cent. already paid in. The names of the first Board of Directors are Michael Reese, Calvin W. Kellogg, John B. Keene, Faxon D. Atherton, William Sharon, the new United States Senator from Nevada, William Burling, and Alfred A. Cohen. These gentlemen are among our heaviest moneyed men, and their aggregate belongings is certainly not less than from \$40,000,000 to \$50,000,000.

## THE MAGNETIC CURVES.

Rev. G. H. Hopkins gives the following method for fixing the curves which steel filings take when under the action of a bar magnet. The filings having been prepared so as to be as nearly the same size as possible, and that size very minute, are poured into a mortar, and a small quantity of finely-powdered resin is added; these are stirred together until the two substances are completely mixed, and then, considerable pressure being exerted upon the pestle, they are rubbed until the resin adheres to the filings in a very fine coating. The filings can then be sprinkled as usual, and the curves formed. It is best (after the curves are formed) to heat the surface (glass, paper, or wood, according to convenience) over a stove or in an oven, which easily allows it to be sufficiently as well as uniformly heated. For projecting the curves on a screen, the following, we believe, is a very effective method:

Cover the glass with thin gum water, allow it to dry perfectly; obtain the curves on dry gummed surface; finally, breathe on the plate; the gum is thereby softened, and the curve permanently fixed. Substituting correspondingly shaped pieces of paper for the magnets (a pinhole can be used to indicate the north pole, the curves can be covered with a second plate of glass, and thus preserved as an ordinary lantern slide.

## MAGNETS FOR ELECTRO-MOTORS.

Magnets or armatures for electro-motors may be softened as follows: Heat the iron to an even, dull red heat all over; and if the surface of the iron has not been faced off in a machine, lightly file it to remove the scale, and then immerse it in common soft soap, allowing it to remain therein until it is quite cold. Then reheat the magnet to an even, red heat, whose redness is barely perceptible, and bury it in pulverized lime, wherein it must also remain until it is quite cold, when the metal will be found as soft as it is possible to make it, and the blade of an ordinary knife will cut it. At the second heating, the iron will emit a light blue flame, showing the effect of the immersion in the soft soap. The conductivity of the magnet may be, by this process, very much increased.

The telegraph line between Tampico and San Luis Potosi, Mexico, has been completed.



## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

May 1875.

## APPOINTMENTS.

W. A. Brower, B'way & Dey st. A. G. Vaughner, Coulterville, Pa.  
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 M. M. Downill, " " J. M. Bell, Alexander, " "  
 J. W. Kelly, " " G. A. Brooks, Parkers, " "  
 H. Shaecomb, " " T. Egan, Pittsburgh, " "  
 F. P. Ross, " " S. McKee, St. Petersburg, " "  
 G. Swift, " " J. Cooper, Bay City, Mich.  
 C. H. Thomas, " " Miss A. T. Wilson, " "  
 C. Van Ethen, " " E. M. Ansen, Buffalo, N. Y.  
 Geo. Warren, " " E. M. Mead, " "  
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 J. K. Heidmark, Harlem, L. J. Powers, Detroit, Mich.  
 J. Hersberg, Johnson's Pool Room, M. S. Corbet, " "  
 C. Cadiz, Merchant's Hotel, Jas. Green, Grindstone City, " "  
 W. H. Baker, 134 Pearl street, C. E. Thompson, Huron, " "  
 Dan'l Bagley, Sturtevant House, W. E. Baker, Jackson, " "  
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 Sam'l Simmons, 689 Broadway, A. C. Fleming, Marshall, " "  
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 N. Y. J. C. Hoffstetter, Plainwell, " "  
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 W. A. Sawyer, New Haven, Ct. P. S. Holey, Niagara Falls, " "  
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 N. T. Blake, South Braintree, Lucious Nichols, Barksdale, " "  
 Mass. Geo. Mason, Jarrett, " "  
 T. J. Morrison, Morrison's A. G. Jones, Livingston, " "  
 Mills, N. B. Pno. Bragg, Norfolk, " "  
 G. Chase, South Margaret's P. B. Phylon, Rapid Ann, " "  
 Bay, N. S. E. P. Rock, Riedsville, N. C.  
 C. T. Lewis, Wentworth, N. S. C. A. Clarke, Guthrie, Ky.  
 G. S. Smith, Bloomington, Ill. E. B. Howe, Lexington, " "  
 Julia Searles, Cedar Rapids, Ia. W. D. Howe, " "  
 O. Newell, Decatur, Ill. G. E. Netherland, Louisville, " "  
 C. T. Loomis, Des Moines, Ia. B. Hicks, " "  
 E. R. King, Keokuk, " I. McClellan, " "  
 Mollie Hughes, Oskaloosa, " M. Coughery, Brownsville, Tex.  
 Emma Bonadale, Racine, Wis. Jno. H. Shields, Lynnville, " "  
 W. L. Shener, U. S. Yards, Ill. G. S. Shewell, Prospect, Tenn.  
 E. A. Philbrook, Milwaukee, Wis. J. H. Garner, Troy, " "  
 G. Donal, Chicago, Ill. J. Mincher, St. Marks, Fla.  
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 G. W. Eitel, " " F. A. Hunn, Baltimore, Md.  
 C. Goodrich, " " Jno. Dennie, " "  
 C. H. Meserve, " " J. M. Patterson, Bloomfield, " "  
 A. H. Baker, " " Jno. Heilmann, Selacton, " "  
 C. G. Meeker, " " A. W. Rittenhouse, Mt. Pleasant, Del.  
 F. Moulton, " " J. S. Buxton, Olney, Md.  
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 S. S. McCullough, Fort Scott, Mo. G. C. Shoemaker, Pottsville, " "  
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 Leon McMahon, Galveston, Tex. Doctor Brower, Spring City, Pa.  
 A. Blucas, Forest City, Ark. Claude Whetstone, Summit Hill, Pa.  
 D. C. Bleakly, Houston, Tex. M. E. Duncan, Trenton, N. J.  
 J. C. McIlvaine, Leavenworth, Kansas. A. C. Rossman, Blue Ridge, Pa.  
 W. R. Longley, Marshall, Tex. J. B. Yeakle, Pimlico, Md.  
 M. F. Ahern, St. Louis, Mo. H. L. Curry, " "  
 E. Burr, Denver, Col. W. B. Scatterford, Parkersburg, W. Va.  
 W. E. Emery, Cheyenne, Cbl. E. W. Barnea, New Orleans, La.  
 A. A. Honey, Salt Lake, Utah. J. H. Riddick, Farmsdale, Ala.

## RESIGNATIONS.

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 J. C. Graham, " " Whitcomb, Milwaukee, Wis.  
 W. J. Ingoldsby, " " C. T. Gooding, Chicago, Ill.  
 O. Kirschbaum, " " M. T. Prentice, " "  
 T. R. Taltevall, " " C. H. Lithgow, " "  
 H. Williams, " " E. Falley, " "  
 W. S. Van Kirk, Cotton Ex. E. P. Delans, " "  
 E. L. Castner, 50 Pine st. J. J. Gallivan, Calvert, Tex.  
 H. L. Hues, Brooklyn, L. I. B. T. Woodman, Denver, Col.  
 S. A. Dow, N. Hampton, Mass. J. T. Curtis, Fort Scott, Kas.  
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 Miss E. L. Thayer, " " Jno. Priddy, Forest ity, Ark.  
 Miss I. Bugbee, " " Geo. Netherland, Houston, Tex.  
 T. F. Bishop, " " W. M. Spink, Kansas City, Mo.  
 Miss A. D. Barbour, Bridgeport, Ct. S. T. Armstrong, Leavenworth, Kas.  
 E. D. Norton, Duxbury, Mass. N. M. Bond, Marshall, Tex.  
 Miss L. A. Huntington, Gt. Barrington, Mass. F. Noel, St. Joseph, Mo.  
 I. C. Perkins, Meriden, Ct. I. C. DeLong, Shreveport, La.  
 W. E. Stuart, Pittsfield, Mass. E. D. Bouton, Denver, Col.  
 T. F. Watson, Salisbury, Ct. H. B. Henderson, Cheyenne, Col.  
 Miss E. S. Thayer, So. Braintree, Ct. C. E. Pomeroy, Salt Lake, Utah.  
 S. H. Walsh, Aspy Bay, C. B. G. A. Brooks, " "  
 D. M. Lennan, Indian Brook, C. B. G. O. Smith, " "  
 C. B. S. McKee, Parkers, " "  
 N. Warren, Ingotish, N. S. A. B. Griswald, Buffalo, N. Y.  
 E. McKee, Mahon, C. B. J. C. Sullivan, Detroit, Mich.  
 S. J. Stevens, Wentworth, N. S. R. B. Hubbard, Huron, " "  
 L. McKinnon, Whycocomal, " R. B. Turner, Jackson, " "  
 W. S. White, Cairo, Ill. F. Leach, Kalamazoo, " "  
 Cuthbert, Des Moines, Ia. A. Robinson, Marshall, " "  
 Davidson, Keokuk, " Jno. McKinney, Otsego, " "  
 Willall, Oskaloosa, " R. B. Beckwith, Plainwell, "

J. J. Powers, Toledo, Ohio. J. F. Miller, Savannah, Ga.  
 W. B. Robertson, Waynesburg, Ohio. J. W. North, Aiken, S. C.  
 F. Ross, Columbus, Ohio. W. B. Bowen, St. Marks, Fla.  
 J. J. Mitchell, Ludlowville, N. Y. S. B. Fielding, Caurak, Ga.  
 W. D. Reed, Oswego, " W. M. Carter, Tremor, La.  
 S. P. Nightingale, Utica, " W. G. Wilkie, Vicksburg, Miss.  
 W. N. Wilkinson, Barksdale, Va. Jno. Beck, Baltimore, Md.  
 S. C. Kelley, Charleston, Tenn. S. T. Travis, " "  
 C. H. Nash, Jarrets, Va. E. Yeary, Bloomfield, N. J.  
 Sam Sotze, Reidsville, N. C. J. W. Buckert, Philadelphia, Pa.  
 Geo. McKnight, Sweet Water, Tenn. E. Burroughs, Trenton, N. J.  
 R. J. McCarty, Montgomery, Ala. J. Groof, Chattanooga, Tenn.

## TRANSFERS.

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M. S. Bocon, " "	Jefferson, Mo.,
T. B. Moxom, " "	Louisville Ky,
B. Hicks, Lexington,	Gen. Supt. Office, NY
C. A. Smith, Louisville, Ky.	Savanna, Ga.
D. F. Brown, Augusta, Ga.	Atlantic City, N. J.
J. A. Hartman, Philadelphia, Pa.	Philadelphia, Pa.
J. E. Foley, Baltimore,	
J. Henneberry, Jersey City, N. J.,	Plainfield, N. J.
J. Haycock, Roselle,	New York.
H. S. Lascomb, Washington, D. C.,	St. Johns, N. B.
J. H. Cleveland, Sackville, N. B.,	Sackville,
R. Waycoll, St. John,	Supt's Office.
J. J. Barry, 822 6th Avenue,	B'way and 34th st.
F. Egar, Sturtevant House,	Pier 41.
S. Fones, Merchants' Hotel,	520 Hudson st.
H. J. Mosier, St. Nicholas	Madison Square,
Jno. McKinney, 134 Pearl street,	24th st. and 8th Ave.
J. F. Meers, Broadway & Dey st.,	516 Broadway.
W. H. Murphy, 812 6th Avenue,	689 Broadway.
W. G. McGowan, 516 Broadway,	St. Nicholas Hotel.
T. A. Redfield, 5th Avenue Hotel,	11 Mercer st.
T. Stevenson, U. S. Yards, N. Y.,	636 6th Avenue.
C. E. Tapley, Madison Square,	Brooklyn.
S. W. Varney, Broadway & Dey st.,	
P. L. Watson, 520 Hudson st.,	
W. S. Williams, Broadway & Dey st.,	812 6th Avenue.
C. L. Brier, 6th Avenue & 42d st.,	Broadway & Dey st.

## DISCOVERIES.

Discoveries in Science are the result either of experiment, of thought, or of chance. An experimental discovery is usually the result of a well-planned attack upon some fortress of Dame Nature—every step, every sap, and every battery being well considered and faithfully followed; or it results from the attacking force perceiving indications of some sunken mine, or unknown treasure, and following it up with care and determination. Davy's discovery of the safety lamp is an example of the first kind. Something was wanted—its requirements were well defined; Nature was asked to supply those wants and requirements, and she was forced, by experiment and inquiry, to reply. Faraday's discovery of magneto-electricity was of the second kind. He was engaged in solving a difficult and intricate problem; something attracted his attention, he followed it up, traced it out, and was rewarded with the discovery of what ought to be universally called *Furadism*.

A discovery, the result of pure thought, must be based on experience. An experiment sets

—That inward eye  
That is the bliss of solitude—

a-working. The imagination is brought into play. Thought pictures something that should be, and observation finds out that it is. Graham's discovery of dialysis, and of the occlusion of hydrogen by iron, was of this character. So have been the innumerable additions made to organic chemistry by Liebig and his followers. So have been the strides made in the theory of energy by Mayer, Joule, Thomson, Clausius, and others. Experiment has set the ball rolling, thought has kept it going, and imagination has said: "If I only direct it in such a path I am sure to alight on some treasure, or it is sure to bring me to the goal I seek."

Discoveries cannot be said to be the simple result of pure chance. Newton and the apple are said to have led to the discovery of gravitation; but the

apple was only the means to direct the thoughts of the philosopher in a certain channel, which certainly led to success; but he had been previously pondering and weighing innumerable other channels and courses. Galvani and the frog are said to have led to the chance discovery of voltaic electricity, but the frog may have jerked its legs on the professor's balcony, or skipped into the physicists laboratory with the energy of a ballet dancer, before it would have led to the discovery of current electricity, unless there had been a trained mind to watch its antics, to follow up its peculiarities, and to ferret out its indications.

Daguerre's discovery of the influence of the vapor of mercury upon sensitive plates of silver is another which is included among chance discoveries. He had been experimenting on silver plates rendered sensitive by iodine, and had, after exposure, put them in a cupboard full of chemicals. To his surprise he found, after a time, pictures develop themselves on the plates, attributing the effect to some chemical. He removed the chemicals, one by one, until all had been removed. The effect, however, continued. He then found an unknown and forgotten flask of mercury, which gave out its vapor, and thus produced the effect observed—and this was the origin of the daguerreotype process. But this was not purely the result of chance. It was the previous training and previous experience which arranged the conditions that lead to the discovery, and which enabled the mind to seize upon those very facts which resulted in success. Training and experience are, therefore, essential in seizing upon abnormal indications of Nature, as they are in comprehending and appreciating their laws, and applying them effectively to practice.—*Telegraphic Journal*.

## PHOTO-ELECTROTYPE PLATES.

MR. WALTER WOODBURY proceeds as follows to make electrotype plates by a photographic process: a plate of metal is coated with gum, glucose and bichromate of ammonia, dried rapidly and exposed under a positive to the light. When the plate is breathed upon it will be found to have different degrees of stickiness, so that when emery or pulverized glass is dusted over it, commencing with a coarse powder and continuing with powder one or two numbers finer, it will found that the coarser particles adhere readily to the most sticky portions, and the finer to the other portions. Then, when the plate has been hardened by a subsequent exposure to the light, it can be used as a mold for obtaining an impression in soft metal, which can be electrotyped.

ACTION OF THE ELECTRIC CURRENT ON FUSED METALS.—The behavior of amalgams and melted alloys, when traversed by the galvanic current, was studied a few years ago by M. Gerardin, who, however, did not make quantitative measurements. We find from *Archives des Sciences* that M. Obach has lately gone into the matter more fully, and arrived at somewhat different results. His conclusions are:

1. The passage of the galvanic current does not produce any electrolysis, either in amalgams or in alloys.
2. After having been traversed by a current, amalgam decomposes equally water at both poles exactly as before.
3. The action of the current does not at all modify the hardness or the malleability of the alloy lead tin, nor the state of fluidity of the alloy potassium sodium.

It does not produce in the composition of the alloy, in the neighborhood of the electrode, any change exceeding the limits of possible error in the analysis.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, JULY 15, 1875.

### THE COMBINED ENVELOPE AND BLANK.

We have received a communication from Mr. Thomas Orton, of Chicago, drawn forth by the allusion in the JOURNAL of June 15th, to a combined envelope and blank for telegraphic use, recently patented by Messrs. Gross and Kelchner, of Springfield, Ill. Mr. Orton takes the same view of the subject as the JOURNAL, that it is from experience only that the value of such contrivances can be determined, and presents various reasons showing their doubtful utility. Mr. Orton, who has had much experience in the service and who has given this particular subject much thought, sends us specimens of a combined blank and envelope which he claims is better adapted to the purpose and which he devised two years ago.

There seems to be but one advantage in the combination, and that, at best, is doubtful. It is in the time saved in addressing the envelope which, as at present, covers the message. This is more than counterbalanced by the incompleteness of the message on its face and the complicated character of the blank.

THE regular quarterly dividend of the Western Union Telegraph Company, two per cent., declared June 9th, is payable at the office of the Treasurer of the Company, Western Union Telegraph Building, on and after July 15th. The transfer books are closed until July 16th.

THE Western Union Telegraph Company is now prepared to pay the principal and accrued interest of its bonds, maturing November 1st, 1875, upon delivery of the bonds at the office of the Treasurer.

AN unexpected demand for the issue of June 1st, 1875, has completely exhausted our supply of the JOURNAL of that date. Our supply of the JOURNAL of February 15th, is also very low. Superintendents and others who may have surplus copies will confer a favor by returning them to this office.

### LATEST FROM THE NEW CABLE.

We have a report from London that the Allan steamship "Prussian," on her voyage from Quebec to Liverpool, passed the "Faraday" on the first day of July. The "Faraday" appeared either to have the new cable on board, or to be grappling for it. As more than two weeks have elapsed since she was seen, the presumption is that she had not succeeded in getting the cable on board, as in that event it would have been practicable to communicate through the cable, which has not yet been done.

The fact is not generally known that the core of the new cable is made on a different plan from all other submarine cables. The standard core is composed of seven strands of copper wire wound spirally upon each other; so that, in the event of a considerable strain upon the cable, the conductors will stretch without parting. The core of the new cable, however, is made of one large copper conductor, with a few very small copper wires wound spirally around it. As this cable has been broken, lost, picked up, spliced, and broken and lost again some six or eight different times, it is probable that in grappling for it, and lifting it—in one instance through water more than two miles deep—the straight, unyielding central copper wire of the core must have been parted in many places, and the "fault"—developed after the laying was completed, and connection between Ireland and Rye Beach was established, and which the "Faraday" is now seeking to repair in water about two miles deep,—was really the parting of the main core. Even if this particular fault is repaired, we apprehend that others of like character will speedily develop, and that in the effort to repair them new ruptures will occur from the straining of the core when the cable is to be lifted through water of great depth.

In short, this enterprise, whose inauguration and progress has been attended by an extraordinary array of wind instruments, seems liable to prove not merely a failure, but discreditable to all concerned.

The operating room of the Central Office of the Western Union Telegraph Company we have already fully described in these pages, and it is, unquestionably, the finest room of the kind on the continent. Recently some fine photographs have been taken of this spacious apartment by a skillful artist, and have been placed in the hands of Mr. Wm. Holmes, Secretary of the Telegraphers' Mutual Benefit Association, to be sold for the benefit of that institution, and who will transmit copies to all who desire them.

The photographs are four in number,

1. Large photograph 10x14.....\$1 75.
2. Same, 8x10..... 1 00.
3. Stereoscopic views..... 50.
4. Photograph of the Switch..... 1 00.

On receipt of the amount Mr. Holmes will mail, postage paid, either of these photographs to any party applying for them. A profit is possible only by a large sale.

### IMPROVEMENTS.

General Superintendent Van Horne is doing excellent service in putting in first rate working order those portions of the lines in the Eastern Division which the fortunate changes of last winter added to the Southern Division. As an illustration of the benefits which are accruing under his supervision we may mention that he has very materially reduced the resistance of some of these wires by soldering the joints, in one case, from twenty to eighteen ohms per mile; in another, from twenty-four to eighteen ohms per mile; and in another from forty-two to sixteen ohms per mile.

It is unnecessary to comment upon the value of work of this description. The first requisite for successfully handling the traffic is good working lines. The first requisite for good working lines is good conductivity. The best way to get this is by soldering the joints. Under the present vigorous treatment the wires between New York and Washington will soon compare favorably with those of the other sections of the Company's system, a result which will be largely appreciated.

### THE NEW CABLE TO MARTHA'S VINEYARD.

The Western Union Cable, connecting Martha's Vineyard with the mainland, was successfully laid on Thursday, 8th instant, from the schooner D. L. Sturgis, in tow of the revenue cutter Gallatin. The cable is one inch in diameter and was made in England. It is working finely, and the Vineyard people are congratulating themselves at no longer being telegraphically isolated from the rest of the world.

The origination of this enterprise is mainly due to Superintendent C. F. Wood, who personally and skillfully superintended the work until its completion.

### THE DIFFERENCE.

In the London Monthly circular of Mr. William Abbott, the following language occurs in reference to the cable communication by the Anglo-American Company: "The splendid organization of the Anglo-American Company has brought the service to as near perfection as it is possible for skill or science to accomplish. The average number of messages per day is 1,150, and is daily increasing. These messages are carried to New York from London in the short space of 8½ minutes. This is the average speed which may be calculated upon, but in many cases this distance of 3,543 miles is accomplished in three minutes. Such a splendid service could only be possible with four cables and a highly trained staff of operators." That is a handsome acknowledgement of a very meritorious service, and stands in marked contrast with another statement, which will be found in our last issue, to the effect that the time of transmission from Madrid to England, via Santander, averages three hours and twenty-six minutes!

On a circular before us a well-known telegraph official says, in reference to the attempt which was made to establish the Gold and Stock Telegraph system in Europe: "A telegraphic system which could give promptly the market quotations of the principal European cities would undoubtedly succeed but the *present slow transmission* of despatches destroys their commercial value." Now, all we have to say in reference to such statements is, "Why is this thus? Why are private enterprises prompt and others otherwise?"

#### EXPRESS MESSAGES.

WHEN a few weeks ago we wrote on the subject of what are termed express messages, by which is meant a class of telegrams which, for a consideration in money, are given priority in transmission, we supposed we uttered the universally accepted sentiment of America on this subject, when we pronounced it dangerous and impracticable. There is not a proposition which can be proposed, which would sooner kindle the anger and opposition of the people. And yet the opinion expressed before and reiterated with deeper conviction now, has not only been sharply criticised by a well-known writer, whose ready and caustic pen never leaves one in doubt of his meaning, but the proposition has been taken up approvingly by a contemporary, and has even found an appreciative place in the *Scientific American*. Such being the fact, we feel drawn to a brief review of the subject to see if there be any point in the proposal to justify the approval thus unexpectedly bestowed upon it.

First of all, we have opposed to the system of preference proposed, the all but universal status of State law which makes transmission by telegraph in the order of reception imperative and fundamental.

It must be clear to the ordinary sense that with such a law in existence, the acceptance of a message for which a pledge of priority in transmission is given in consideration for money paid, would be an act hostile to public law and, presumably, to public justice. There is no argument necessary in such a case. It is a mere question of fact. The law forbids preference, and imposes a penalty therefor. It recognizes every message as of like value. It was passed to prevent the injustice which preference implies.

We are told that it has been always the custom to give certain messages preference on account of their apparent value. We deny the fact; and even admitting it, we deny that such preference was ever given with the knowledge of the parties sending the messages thus illegally delayed. Such knowledge would have led to universal public protest. We say, therefore that even were it an admitted custom, which it is not, any system, which is possible only by such concealment, is, on its face an affront to law, to morals, and to public justice. Men seek the telegraph office because they expect and need speedy transmission, and a telegraph company has no right to pronounce upon the relative value of messages placed in their hands, or to entertain any system which

makes a right of selection a part of its operations.

Again we are asked, why cannot there be an express message as well as an express package, and and the same distinction be made in messages as between slow and fast freights? We answer, simply because the mail and the night service already provide for slow messages. In ordinary telegraphing there is everywhere understood promptitude—the practical annihilation of time. In the night service there is a clear understanding that a message left during the night will be delivered promptly in the morning. There is a measure of exactness in this even more expressive than in ordinary service. It gives all night for a message to reach its destination, and conveys a kind of certainty that by an early hour it will be delivered. This is easy of understanding. It is satisfactory, especially when the service, as is usually the case, is distant. But this would be all wanting in a delayed day service, and the absence of obligation to transmit promptly would lead to widespread carelessness and abuse. No idea of prompt delivery being given, the parties acting under the uncertainty, would resort to the express message with its added cost. This Hubbard & Co. understood when they offered to transmit the public business at a low rate with this privilege of priority messages and a high tariff conceded to them. There was the concealed cream. The priority or express rate would have certainly become the general rate. The scheme of a low tariff, which it bore on its face was the proposition of a sublime deception.

Writing on this very subject a year or more ago, we gave the following illustration. It is just as good now as then.

"A lady steps into an office at Newburgh, and telegraphs her husband to meet her at New York. As the clerk receives it from the fair fingers, he remarks: 'No hurry about this, I presume?' 'No hurry!' replies the astonished lady. 'Why, yes, of course; don't you see my husband must meet me at the depot, and he must get it immediately?' 'Oh!' ejaculates the clerk, 'all right, we will give it 'priority'—fifty cents, ma'am.' 'But,' rejoins the lady, 'I understand the rate to be only 25 cents; why should I pay more?' 'Oh, you know, ma'am, we put your message ahead of all others, you know, ma'am, and charge double, you know. But if you will take your chances and let us send as we can, why, then, it is only 25 cents.' Of course the 50 cents is paid with a frown and a feeling of indignation. And so in the vast majority of cases would it be found that the real tariff had become 50 cents, and the imaginary one 25, until public indignation broke every telegraph window, and shut up every 'priority' shop."

Gentlemen, it won't do!

The tenth edition of Smith's Manual of Telegraphy and illustrated catalogue of telegraph machinery and material, published by L. G. Tillotson & Company of New York, has been received at this office. Beside the usual amount of information for novices, this edition contains an introductory article from the pen of Mr. Jesse H. Bunnell, which conveys to the beginner, in a concise manner, much needful instruction in the rudiments of the art.

#### TELEGRAPHERS' ANNUAL REUNION.

The seventh annual Fourth of July re-union and excursion of the telegraphers in the employ of the Western Union Company, on the lines of the Erie, New York Central and Northern Central railroads, took place this year, on Monday last, at Hammondsport, and at Spring Grove, on Lake Keuka. There were sixty-five persons in all composing the party, including representatives from all the important offices of the company on the line of the Erie and its branches from New York to Dunkirk and Rochester, on the New York Central from Buffalo to Utica, and on the Northern Central from Elmira to Canandaigua. Several ladies accompanied the party, and added much by their presence to the enjoyment and sociability of the affair. The following letter from Mr. A. B. Cornell, Vice-President of the Western Union Company, to Mr. A. S. Parmelee, manager of the Owego (N. Y.), office, is a gratifying evidence of the favor with which the officers of the company regard these gatherings, as well as the active sympathy and the mutual interest existing between the officers and their employés.

NEW YORK, June 25th, 1875,

A. S. PARMELEE, Esq., Owego—*My Dear Sir:* I have been much interested by the perusal of the circular in reference to the "Seventh Annual Re-Union of the Telegraphers of New York," which you were kind enough to give me at our recent interview. I cannot doubt that these annual gatherings are the source of much pleasure, and of great good to those of the profession who participate in them.

With the view of promoting the interest of the operators in Central New York, in such a meeting for the next year, I venture to tender through you an invitation to the members of your organization to meet me at Ithaca, on the Fourth of July, next year. As you know, Ithaca is located midway between the Central and Erie roads, and is accessible by a direct train from Syracuse, Cayuga, Geneva, Elmira, Waverly, and Owego, and beside being the centre of much attractive scenery, is the seat of the Cornell University, which owes its origin and much of its subsequent development to men who were successful in the early organization of the telegraph as a business enterprise in the United States, and I feel confident that yourself and associates will find much to interest them, and I hope to fully repay them for the visit.

If this invitation proves acceptable, it will afford me great pleasure in promoting a large attendance of your professional brethren from Central New York and Pennsylvania, and I shall hope to induce the attendance of a number of the officers of this company to meet them.

I will thank you to inform me of the action on this subject at your earliest convenience, and remain with great respect. Yours, very truly,

ALONZO B. CORNELL.

The letter was received with applause, and the invitation to hold the next annual re-union at Ithaca unanimously accepted.

#### A TELEGRAPH OFFICE IN THE CLOUDS.

The Western Union Telegraph is completing a tower of fifty feet in height on the crest of the lofty Highlands of Neversink. The operators, who are to have the most powerful glasses, will be able to distinguish steamers and other vessels twenty miles out.



## TELEGRAPH SECURITIES.

Mr. William Abbott, of London, in his Monthly Circular, has the following with respect to telegraph securities: The principal feature of this market during the past month has been the further decline of as much as 10 per cent. in Anglo-American stock which, when added to that recorded in the previous month, makes a reduction of about a million sterling since the meeting in April. It will be remembered that on that occasion I warned the directors that the policy of secrecy to which they seemed fatuously wedded would bring about the very serious results which have thus been experienced. However, they have now practically condemned their own policy by deciding to abandon it, and although the decision comes too late to be of any service to those who have been frightened out of their stock by the mysterious and alarming statements as regards the traffic, which have been so industriously circulated by the enemies of the company, it is very satisfactory that wiser counsels have at last prevailed, and an end is to be put to the absurd and unsuccessful policy of mystification. Had it not been for the severity of the crisis, the directors would no doubt have still obstinately clung to their practice of not letting the proprietors know the true position of their property; but, like every other concession which the shareholders have desired, it has been wrung from the Board by a force which could not be withstood. Holders of Anglo-stock are sorely puzzled as regards the prospect of their property. Without venturing to predict the future course of events, or to give advice which may not prove valuable, I would say that the most sensible thing to do is to await quietly the threatened competition. So far there has been nothing but alarming rumor as to what this new wonder is to accomplish, but there is this great fact, which the majority of the Anglo-American shareholders do not know, that with the splendid organization of the Anglo-Company the service has been brought as near perfection as it is possible for skill or science to accomplish; thus, the average number of messages over the lines is now 1,150 per day, and is daily increasing. These messages are carried between London to New York in the short space of 8½ minutes. This is the average speed, which may be calculated upon by the customers of the Anglo, but in many cases this distance of 3,543 miles is accomplished in three minutes. Such a splendid service could only be possible with four cables and a highly trained staff of operators. The pending arrangements for extending the line of the Eastern Extension Company from Australia to New Zealand is a most important operation as affecting the interests of that as well as the Eastern Telegraph Company. The rapid development of the colony of New Zealand renders it indispensable that telegraph communication with the mother country should be established without delay, and it is very satisfactory that the colonial authorities have given substantial evidence of their appreciation of its advantages by making a special agreement to enable the tariff to be moderated without detriment to the shareholders. On the completion of this link, there is little doubt that the cable from the Cape via Mauritius to Aden will be immediately undertaken. This will be a work of some magnitude, and one in which it is understood the co-operation of the Cape Government will be given in the form of a guarantee. All these new lines will, of course, become valuable feeders to the Eastern Company. The prospectus of the new issue of the Globe Telegraph and Trust Company will be circulated to all telegraph shareholders next week, and I strongly urge upon every proprietor the importance of accepting the valuable additional strength to their investments to be obtained by the

preferred and deferred principle of the Globe Trust. Telegraph Construction and Maintenance Company shares have fluctuated during the month, but the low quotations were of short duration, buyers having again come forward to take advantage of them, and prices now show considerable firmness. The advice which I gave so many of my friends to exchange Chatham and Dover stock at £27 into Construction at £24, has already, I am glad to say, resulted beneficially to those who adopted it. I still continue the advice, for in the one case there is the security of sound management, which is wanting in the other, as evidenced by the recent collapse of the most important and necessary fusion ever announced to a body of shareholders. It is extremely probable that at the meeting to be held next month, the Chairman will be in a position to announce some important contracts, including that for the line to unite New Zealand with Australia.

## FOREIGN ITEMS.

The International Telegraph Conference at St. Petersburg has passed a resolution forbidding the artificial formation of compound words. The Conference has accepted the principle of letters as a substitute for a measure of words deciding, that, within the limits of Europe, five letters shall be equivalent to a word and on transatlantic lines, or lines going beyond Europe, ten.

The traffic receipts of the Eastern Telegraph Company for the month of May amounted to £30,602, against £30,225 at the corresponding period of 1874; and of the Eastern Extension, Australasian and China Telegraph Company to £17,773, against £18,879 last year.

The traffic receipts of the Brazilian Submarine Telegraph Company for the month of May amounted to £12,080.

The number of messages passing over the Cuba Sub-marine Telegraph Company's lines during the month of May (including those of the new station at Cienfuegos) was 2,481, estimated to produce £2,400 against 1,788 messages, producing £1,851, in the corresponding month of last year. The actual receipts of the three months ending March amount to £7,153, as compared with the estimated amount of £7,100.

The West India and Panama telegraph cable between St. Thomas and St. Kitts has been repaired, and all the stations on the company's system are now, therefore, in telegraphic communication with Europe.

The traffic receipts of the Direct Spanish Telegraph Company for the month of May amounted to £1,442 9s. 2d., against £1,494 14s. 6d., in April.

The number of messages forwarded from postal telegraph stations in the United Kingdom, for the week ended May 29, was 409,008, an increase over the corresponding week last year of 62,373.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ended the 5th of June, 1875, was 415,296; week ended June 6, 1874, 385,279; increase in the week of 1875 on that of 1874, 30,017.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending June 12th, 1875, 415,422; an increase on the corresponding week last year of 40,248.

The Anglo-American Telegraph Company announces a quarterly dividend at 1½ per cent., or at the rate of 5 per cent. per annum.

## The Telegraphers' Mutual Benefit Association.

ESTABLISHED OCT. 12, 1867.

Its object is to Aid the Families of Deceased Members, by the payment to the Heirs of \$1,000.

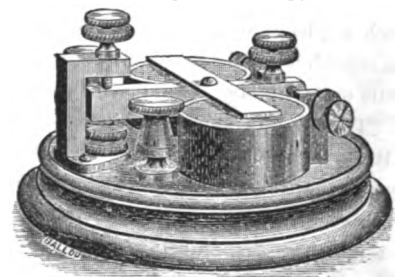
Send to any one of the following list of the AGENTS OF THE ASSOCIATION

for application blanks and copies of the By-Laws:

ALBANY, N. Y.	CHAS. C. KING.
AUGUSTA, Ga.	J. M. CROWLEY.
ATLANTA, Ga.	J. HERRICK.
BALTIMORE, Md.	ARCH. WILSON, Jr.
BOSTON, Mass.	E. A. BEARDSLEE.
BUFFALO, N. Y.	J. W. TILLINGHAST.
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HEMPSTEAD, Tex.	L. S. DANIELS.
INDIANAPOLIS, Ind.	D. C. HINDSDALE.
KANSAS CITY, Mo.	M. D. WOOD.
LAFAYETTE, Ind.	H. E. DOOLITTLE.
LITTLE ROCK, Ark.	L. C. BAKER.
LOUISVILLE, Ky.	W. A. L'HOMMEDIEU.
MOBILE, Ala.	WM. SANDFORD.
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SAN FRANCISCO, Cal.	N. H. BROWNE.
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Improved.



PRICE, \$6.00.

THE FINEST SOUNDER MADE.

THOUSANDS IN USE.

THEY SELL THEMSELVES.

Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful Little Sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. PRICE, \$4.00.

No cast or malleable iron used in these instruments.

Sounder and Key, together. \$9.00.

Orders filled promptly and sent on receipt of price, or C. O. D., if 10 per cent. accompanies the order.

M. A. Buell &amp; Sons,

86 Bank Street, Cleveland, O.



WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
New York, June 9th, 1875.

**DIVIDEND No. 32,**

THE BOARD OF DIRECTORS have declared a Quarterly Dividend of **TWO PER CENT.** on the Capital Stock of this Company, from the net earnings of the three months ending June 30th instant, payable at the office of the Treasurer, on and after the 15th day of July next, to shareholders of record on the 19th day of June.

The transfer books will be closed at three o'clock on the afternoon of the 19th instant, and opened on the morning of the 16th of July.

**R. H. ROCHESTER,**  
Treasurer.

WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
New York, July 2d, 1875.

This Company is now prepared to pay the principal and accrued interest of its Bonds, maturing November 1st, 1875, upon delivery of the Bonds at this office.

**R. H. ROCHESTER, Treas.**

**OPERATORS' CHANCE!**

ELECTROTYPE Cards of Key, Sounder and Relay, with your name printed in handsome type on 25 extra fine Bristol, white and tinted, for 25c., or 50, with business and address, for 50c. Samples, 3c. Railroad Operators send 10cents extra for conductor's and brakemen's electrotype cards. You can make money. Agents outfits, with the handsomest and most stylish cards printed, for 25c.

Address, **F. P. MUNN,**  
Clyde, Wayne County, N. Y.

**A Great Reduction in Prices.**

I am now making a specialty of my **PHIL. SHERIDAN SOUNDER AND KEY**, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



**PHIL. SHERIDAN, \$4.00.**

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. Extra.



**PHIL. SHERIDAN KEY, PRICE, \$2.00.**

You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, etc., etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Callaud Battery, 1 lb. Blue Vitrol, Connection Wire, Book of Instruction, etc., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

**A. B. LYMAN,**  
91½ SENECA ST., Cleveland, Ohio.

**CALLAUD BATTERY,**

KEPT ON HAND

AND

Orders filled by

**W. MITCHELL McALLISTER,**  
728 Chestnut Street, Philadelphia.  
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AND BY

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Agents for the United States.

220 KINZIE ST., Chicago, Ill.

**LECLANCHE BATTERIES.****IMPORTANT NOTICE.**

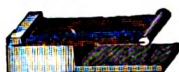
After January 1st, 1875, we allow **20 cents** for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

**The LECLANCHE Battery Co.,**  
40 West 18th Street.

Or to **L. G. TILLOTSON & CO.,**  
Sole Agents,  
No. 8 Dey Street.

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**The "Snapper" Sounder.**

PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

**PRICE 75 CENTS.**

Sent post-paid on receipt of price.

**R. W. POPE, Box 5278, N. Y.**

**EUGENE F. PHILLIPS,**

MANUFACTURER OF

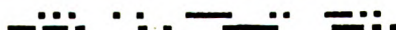
**REED & PHILLIPS' PATENT INSULATED TELEGRAPH WIRE,**

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**No. 20 CONDUIT STREET,**

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**AMERICAN LINE.**

Weekly Mail Steamship service between

**PHILADELPHIA AND LIVERPOOL,**

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from Philadelphia.

OHIO.....	July 15	PENNSYLVANIA.....	Aug. 5
ILLINOIS.....	July 22	INDIANA.....	Aug. 12
*KENILWORTH.....	July 29	*ABBOTSFORD.....	Aug. 19

PRICES OF PASSAGE IN CURRENCY.

**Cabin, \$100.**

Steerage and intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate, Passenger accommodations for all classes unsurpassed.

For passage, rates of freight and other information apply to  
**GEO. W. COLTON, Agent, 42 Broad street, N. Y.**  
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**PETER WRIGHT & SONS, General Agents,**  
307 Walnut Street, Philadelphia,  
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**Red Star Line.**

Appointed to carry the Belgian and United States Mail.

The following Steamers are appointed to sail

**FOR ANTWERP.**

From Philadelphia.

From New York.

NEDERLAND.....	July 31	SWITZERLAND.....	July 20
VADERLAND.....	Aug. 25	STATE OF NEVADA.....	Aug. 13

**FROM ANTWERP.**

For Philadelphia.

For New York.

VADERLAND.....	Aug. 1	STATE OF NEVADA.....	July 20
NEDERLAND.....	Aug. 25	SWITZERLAND.....	Aug. 13

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - - - \$90. Second Cabin, - - - \$60

Steerage tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed.

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**PETER WRIGHT & SONS, General Agents,**  
307 Walnut Street, Philadelphia.  
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**WESTERN ELECTRIC MANUF'G CO.**

SOLE AGENTS,

**Orton's Patent Awl Clip.**

These Clips have been in practical use for three years, and are rapidly displacing all others.

They are designed for holding messages and every form of blanks.

For convenience, durability and economy they are unsurpassed.

**Western Electric Manuf'g Co.**

220 KINZIE STREET, Chicago, Ill.

**ORTON'S****Patent Security Message Hook.**

The damage resulting from the loss of a single message is frequently sufficient to equip a line many times with this hook. Papers cannot be blown or carelessly crowded from it.

These Hooks were first introduced by Geo. H. Bliss & Co.

Thousands of them are in use in telegraph offices, banks and counting rooms.

PRICE 30 CENTS EACH, or \$3.00 PER DOZEN.

Liberal terms to the trade.

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**AMERICAN FIRE ALARM.**

AND  
**POLICE TELEGRAPH.**

**GAMEWELL & CO., PROPRIETORS.**

**NO. 62 BROADWAY, NEW YORK.**

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**ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,**

San Francisco, Cal., Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

**AUTOMATIC PLAN.**

is now in operation in the following cities, to which reference is made for evidence of its great **SUPERIORITY, VALUE** and **UNIFORM RELIABILITY** :

Albany, N. Y.  
Alleghany, Pa.  
Boston, Mass.  
Buffalo, N. Y.  
Baltimore, Md.  
Chicago, Ill.  
Cincinnati, Ohio.  
Columbus, Ohio.  
Cambridge, Mass.  
Charlestown, Mass.  
Covington, Ky.  
Detroit, Mich.  
Dayton, Ohio.  
Elizabeth, N. J.  
Fall River, Mass.  
Fitchburg, Mass.  
Hartford, Conn.  
Jersey City, N. J.  
Louisville, Ky.  
Lawrence, Mass.  
Mobile, Ala.  
Montreal, Canada.  
Milwaukee, Wis.  
New York City.  
Lynn, Mass.  
Lowell, Mass.

New Orleans, La.  
New Haven, Conn.  
Newark, N. J.  
Omaha, Nebraska.  
Philadelphia, Pa.  
Pittsburg, Pa.  
Portland, Me.  
Peoria, Ill.  
Providence, R. I.  
Quebec, L. I.  
Rochester, N. Y.  
Richmond, Va.  
Indianapolis, Ind.  
St. Louis, Mo.  
St. John, N. B.  
Springfield, Mass.  
San Francisco, Cal.  
Savannah, Ga.  
Syracuse, N. Y.  
Troy, N. Y.  
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Toronto, Canada.  
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The distinctive features of these systems of

**FIRE ALARM AND POLICE TELEGRAPHS**

ARE

*First*—The **AUTOMATIC SIGNAL BOXES**, the simple electro-mechanism of which enables anyone—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The **AUTOMATIC REPEATER**, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchmen.

*Third*—The **ELECTRO-MECMANICAL BELL STRIKERS**, adapted to produce the full tone of the largest church or tower bells.

*Fourth*—The **ELECTRO-MECHANICAL GONG STRIKER**, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

*These features combined form the*

**ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM**

OR

**FIRE ALARM TELEGRAPH IN THE WORLD.**

Messrs. **GAMEWELL & CO.** are the owners of the original **FARMER AND CHANNING PATENTS**, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

**MORE THAN TWENTY PATENTS,**

The introduction and operation of the

**AUTOMATIC SYSTEM**

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

The co-operation of **TELEGRAPHERS** in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

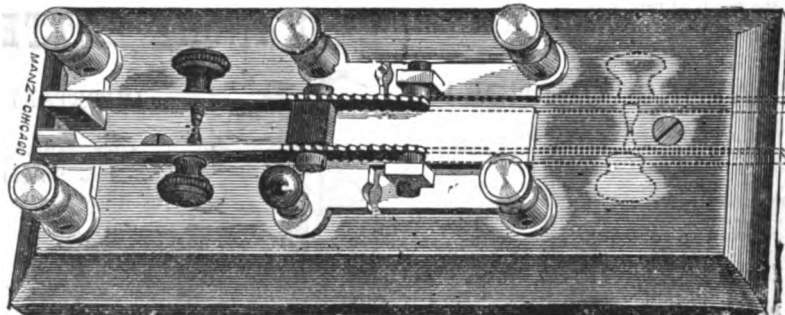
**THE WESTERN ELECTRIC MANUFACTURING CO.**

**330 KINZIE STREET, CHICAGO, ILL.**

WE KEEP IN STOCK THE FOLLOWING ARTICLES :

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**COMPOUND WIRE,**  
**SCREW GLASS INSULATORS,**  
(Cauvet's Patent).  
**BRACKETS, PINS, SPIKES,**  
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**PLIERS, VISES, PULLEYS, CLIMBERS,**  
**WINDOW TUBES, BATTERY BRUSHES,**  
**SYRINGES, FUNNELS, HYDROMETERS,**  
**ACIDS AND CHEMICALS FOR BATTERIES,**

**KERITE WIRE,**  
**BRAIDED AND WOUND OFFICE WIRE,**  
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**CALLAUD BATTERY,**  
**DANIELL BATTERY,**  
**GROVE BATTERY,**  
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**REGISTERS,**  
**RELAYS,**  
**BOX RELAYS,**  
**SOUNDING RELAYS,**  
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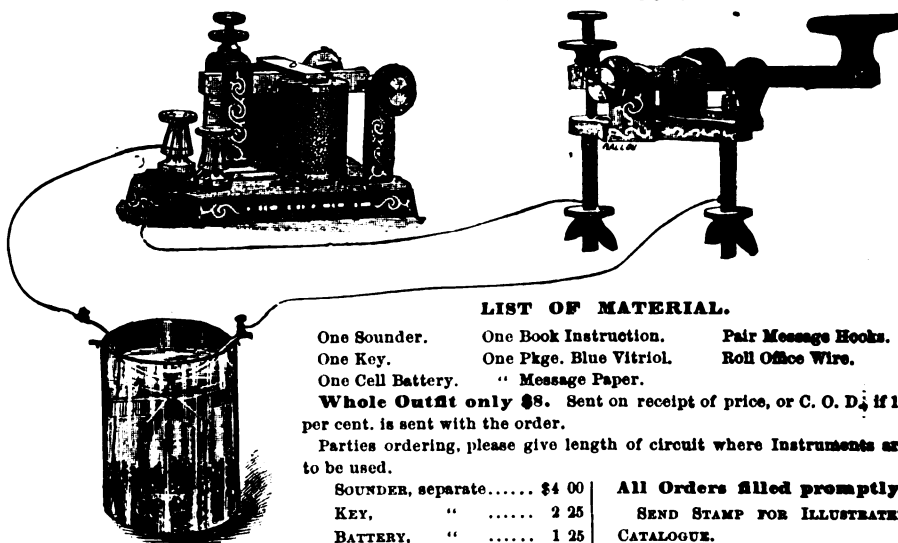
**KEYS,**  
**MEDICAL INSTRUMENTS,**  
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**PLUG CUT-OUTS,**  
**CUT-OUTS, (new style),**

**REPEATERS,**  
**SWITCHES,**  
**GALVANOMETERS,**  
**INDUCTION COILS,**  
**ALARM BELLS,**

eg. Our Morse Instruments are of the Western Union, Ottawa (or Caton) style.  
We have ample facilities for the execution of every variety of electrical work.

**THE EUREKA INSTRUMENT.**

**A COMPLETE SET FOR OFFICE USE.**

**LIST OF MATERIAL.**

One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
One Cell Battery.	" Message Paper.	

**Whole Outfit only \$8.** Sent on receipt of price, or C. O. D. if 10 per cent. is sent with the order.

Parties ordering, please give length of circuit where Instruments are to be used.

SOUNDER, separate.....	\$4 00	<b>All Orders filled promptly.</b> <b>SEND STAMP FOR ILLUSTRATED CATALOGUE.</b>
KEY, " .....	2 25	
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**M. A. BUELL & SONS, 86 Bank St., Cleveland, O.**

**NO OTHER MAIN LINE SOUNDER** has proven as **PERFECT** an **INSTRUMENT** as that made by us the past two years.

**NO RESISTANCE, EASY ADJUSTMENT AND HANDSOME APPEARANCE COMBINED.**

No other instrument offered for this purpose has the advantages secured to ours. See other columns of this paper.

**WATTS & COMPANY,**  
**No. 47 Holiday Street,**  
**BALTIMORE, MD.**

Send for Catalogue and Price List.

**SCREW GLASS INSULATORS AND BRACKETS,**

Of the size and thread used by the Western Union Telegraph Company.

Having secured an Exclusive Agency for the Insulators, (manufactured under the Cauvet patent,) we are filling orders promptly for large or small quantities, at prices as low as any Insulator can be sold for in the market.

**THE WESTERN ELECTRIC MFG. CO.,**  
**330 Kinzie Street,**

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**WATTS & COMPANY,**

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**SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS,  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
SWITCHES, GALVANOMETERS,  
RESISTENCE COILS.**

**A COMPLETE STOCK OF EVERYTHING FOR THE TELEGRAPH  
OFFICE OR CHEMICAL LABORATORY.**

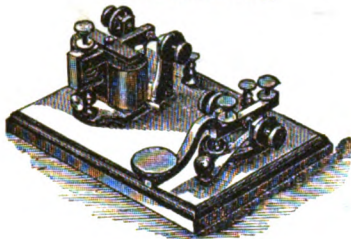
Special attention given to repairing Scientific instruments.  
Several of our workmen having served their time in the most  
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satisfaction.

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[ESTABLISHED 1856.]



\$11.50

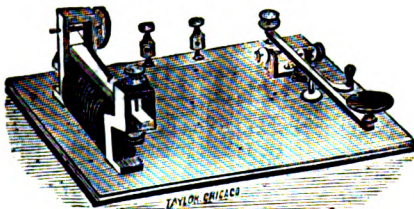
MANUFACTURER ON

**Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.**

## **THE AMATEUR Telegraph Apparatus**

Comprises **SOUNDER, KEY CUP OF BATTERY, CHEMICALS, WIRE AND MANUAL.**

Several thousand of these instruments already sold,  
They give good satisfaction.

**PRICES:**

AMATEUR OUTFIT, COMPLETE, No. 1, . . .	\$7 50
" " " " No. 2, . . .	6 50
" SOUNDER AND KEY, No. 1, . . .	6 50
" " " " No. 2, . . .	5 50
" BATTERY, PER CELL, . . .	65

**DISCOUNTS.**

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

**GEO. H. BLISS & CO.,**

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## **BUNNELL'S NEW GIANT SOUNDERS PERFECTED.**

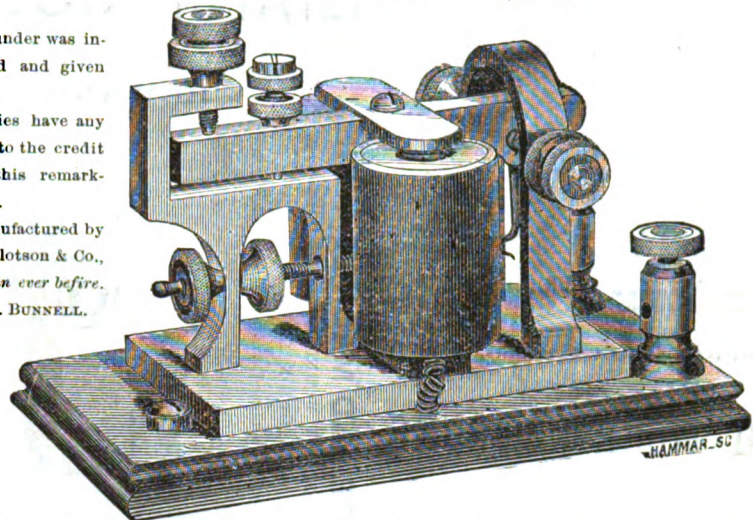
[J. H. BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was invented, patented and given its name by me.

No other parties have any claim whatever to the credit of originating this remarkable instrument.

It is being manufactured by Messrs. L. G. Tillotson & Co., more perfectly than ever before.

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable and substantial shape.

They give enormous sound with but little Local Battery power.  
Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder is desired.

**PRICE, \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

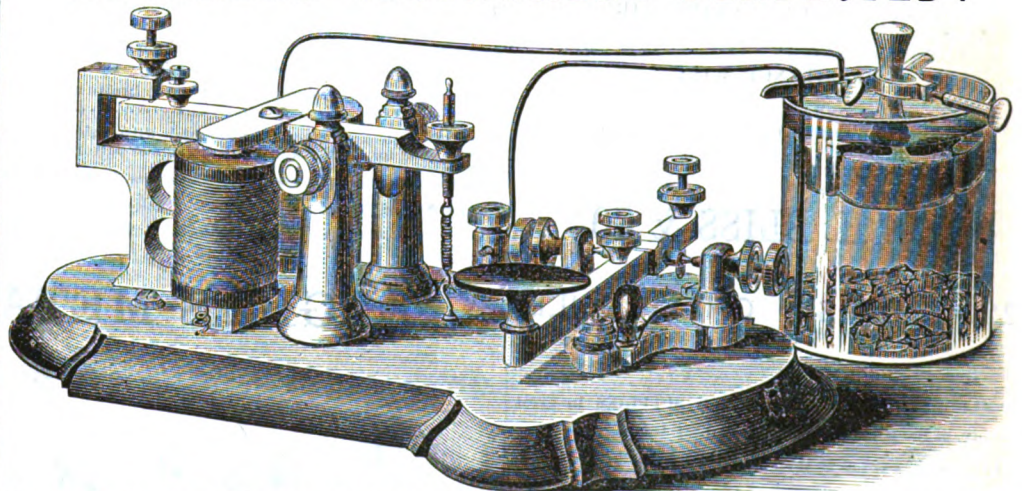
**L. G. TILLOTSON & CO.,**

8 Dey Street, New York,

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

## **BUNNELL'S LEARNERS' INSTRUMENT PERFECTED!**



**Complete and Perfect, full-sized Sounder and Key complete, with  
Book of Instruction, Battery, Wire and all necessary Materials.**

[These instruments have been greatly improved in their working qualities and in the style in which they are finished.  
Those having the latest improvement in their construction are those manufactured only by Messrs. L. G. Tillotson & Co.  
JESSE H. BUNNELL.]

These Sets are made in the best manner, and are just exactly the thing wanted

FOR LEARNERS' USES,

FOR TELEGRAPH SCHOOLS,

Or FOR SHORT LINES, from a few feet to 12 miles long.

Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials  
to put in operation, singly or on a short line . . . \$8 50  
Learners' Instrument, without Battery, &c., . . . 6 50  
Ornamental Learners' Instrument, Rubber Covered Coils, &c., . . . 7 50  
Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines  
up to twelve miles in length, \$1.00 in addition to above prices.

These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order or Draft.

**L. G. TILLOTSON & CO.,**

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.



## A SUPERIOR PRINTING TELEGRAPH INSTRUMENT,

For Private and Short Lines.

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. H. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is **SIMPLE, RELIABLE**, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

### PRIVATE LINES

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employes, &c., for the introduction of the Printer.

For further particulars, terms, &c., apply to

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INSTRUMENT AND OFFICE WIRES,

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WIRES OF EVERY VARIETY OF INSULATION.

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TELEGRAPH INSTRUMENTS AND SUPPLIES in great variety, of the latest patterns and highest finish.

Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on Instruments of our manufacture, when remittance accompanies order.

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## COPPER OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND,

SINGLE AND DOUBLE, WITH COTTON, LINEN, SILK;

PARAFFINED OR VARNISHED, COMPRESSED  
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Manufactured and for sale by

**WESTERN ELECTRIC MANUFACTURING CO.,  
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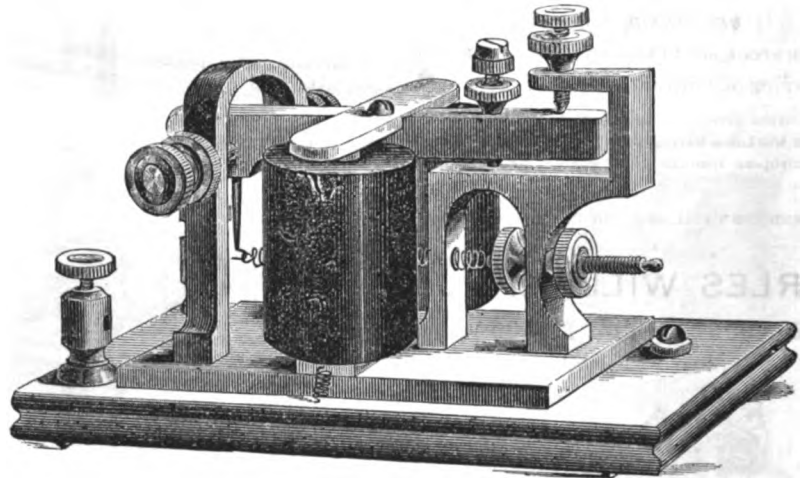
## PARTRICK & CARTER,

THE ONLY MANUFACTURERS OF THE ORIGINAL

## GIANT SOUNDER, PERFECTED,

Patented February 16, 1875.

BEWARE OF WORTHLESS IMITATIONS.



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. *Every instrument warranted perfect.*

**PRICE, sent C.O.D., \$7.50,**

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

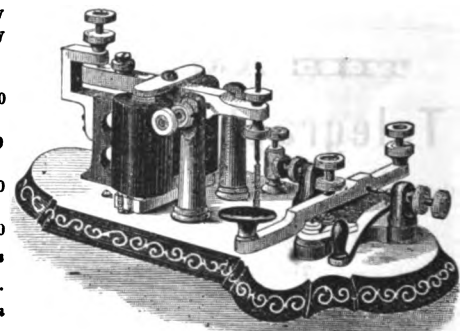
Price of single instrument, good for one mile or less, without Battery, &c. \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7 50

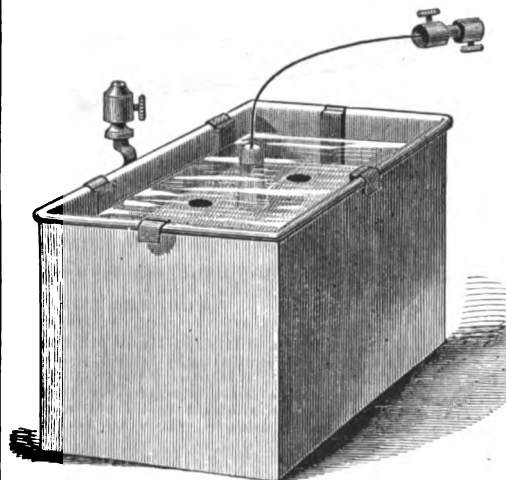
Price of single instrument, good for one to twelve miles, without Battery, &c. 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8 50

*This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.*



## EAGLE'S METALLIC BATTERY.



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the **best and most powerful of all constant batteries**, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and **DOUBLE THE AMOUNT OF POWER** of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and **ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.**

For OPEN CIRCUITS, where all other gravity batteries are **ACKNOWLEDGED FAILURES**, the Eagle's Battery is found to be in every respect a **PERFECT SUCCESS.**

### PRICES:

No. 1, Square Cell, complete, - - - \$3.25  
No. 2, Round " " - - - 2.00

**PARTRICK & CARTER, Sole Agents,**

38 South 4th Street, PHILADELPHIA, Pa.

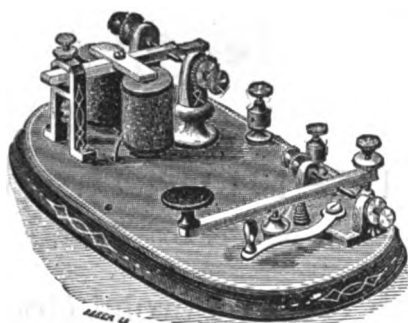
# Western Electric Mfg. Co., CO-OPERATIVE MFG. CO., 218 Pear St., Philadelphia.

220 KINZIE STREET, Chicago, Ill.

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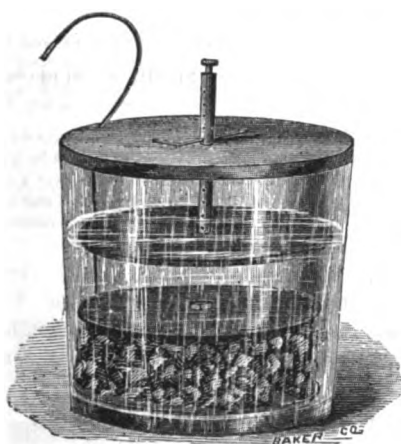
## PRIVATE LINE OUTFIT,

THE BEST IN THE MARKET.



## PRIVATE LINE INSTRUMENT.

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on a line from a few feet to ten miles in length.



## BLISS' RESERVOIR BATTERY.

This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

With each "Private Line Outfit" is furnished one Private Line Instrument, one cup of Bliss' Reservoir Battery, the necessary Chemicals, Wire for connections, and a Manual.

### PRICES:

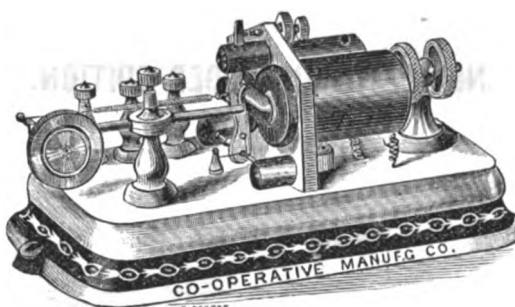
PRIVATE LINE OUTFIT, complete, . . . \$10 00  
INSTRUMENT ONLY, . . . 8 00  
BLISS' RESERVOIR BATTERY, per cell, . . . 2 00

### DISCOUNTS:

A discount of twenty per cent. will be allowed when remittance is made in advance. Remit by express, registered letter, postal order, or draft.

In ordering, state length of line so that the resistance of instruments may be proportioned accordingly.  
Send for Circular. Liberal terms to Agents,

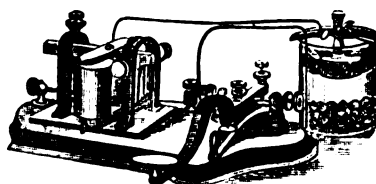
**WESTERN ELECTRIC MFG. CO.,**  
Chicago, Ill.



### W. U. Pattern Relay.

This Relay is acknowledged to be the best in use.  
Is finely finished.

Price, . . . \$16.



### Co-operators' Learners' Instrument No. 1.

A complete outfit embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practising or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined.

The above instrument is nicely finished in brass, and not like other manufacturers' that are made of cast iron.

Price of No. 1 instrument when money is sent  
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With Battery, . . . 9 50  
When sent C. O. D., . . . 8 50  
With Battery, . . . 10 00

N. B.—Either of the above Instruments can be made to work on a circuit from one to twelve miles by Winding Magnets with fine wire which will make cost of instrument one dollar extra.

Send for Price List.

W. R. BALDWIN, Manager, 218 Pear Street, Philadelphia.

**CHAS. T. CHESTER,**  
104 CENTRE STREET, N. Y.,  
TELEGRAPH ENGINEER,  
And Manufacturer of  
INSTRUMENTS, BATTERIES,  
AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES.

Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their Business, domestic and foreign, enabling them to keep pace with telegraphic progress. They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

CALIFORNIA AGENCY  
FOR

## Partrick & Carter's Instruments.

NEW PERFECTED GIANT SOUNDERS,  
IMPROVED CURVED KEYS, LATEST AND BEST,  
CHAMPION LEARNERS' INSTRUMENTS,  
SPLENDID NEW POCKET RELAYS, AND  
REGULAR RELAYS.

Address GEO. M. POMEROY, San Jose, California.

## ORTON'S

## PATENT PENCIL HOLDER.

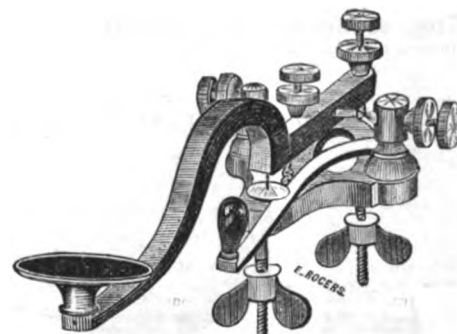
This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS:

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price.  
Price per dozen, . . . 60 cents.

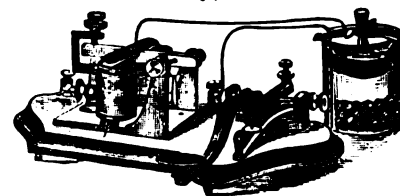
**GEO. H. BLISS & CO.,**  
CHICAGO, ILL.



### No. 1 Key.

This Key is of a beautiful design, and durable in construction, and is perfect in all things which constitute an excellent working Morse Key. No. 1 Key Curved or Straight Lever.

Price, . . . \$4 75  
W. U. Pattern Key, . . . 5 00



### Co-operators' Learners' Instrument No. 2.

THIS BEATS THEM ALL.

We here present a cut of our No. 2 Learners' Instrument, which is comprised of a full size Key and Sounder. We can safely say this Instrument is far ahead of other manufacturer's as to price and quality; it is finished in bronze and mounted on a walnut base.

Price of No. 2 Instrument when money is sent  
in advance, . . . \$5 00  
With Battery, . . . 6 50  
When sent C. O. D., . . . 5 50  
With Battery, . . . 7 00

N. B.—Either of the above Instruments can be made to work on a circuit from one to twelve miles by Winding Magnets with fine wire which will make cost of instrument one dollar extra.

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MARSHALL LEFFERTS, JAMES H. BANKER,  
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GEO. H. MUMFORD, H. R. PIERSON,  
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This Company furnish

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COTTON AND PRODUCE EXCHANGE, and

GENERAL COMMERCIAL NEWS REPORTS

To its Subscribers,

By Telegraphic Printing Instruments,

At their respective places of business; and also erect and maintain

PRIVATE TELEGRAPH LINES

For Corporations and individuals, operated with

## PRINTING INSTRUMENTS.

As manufacturers of all the perfect TELEGRAPHIC PRINTING INSTRUMENTS in use, and owners of a large number of Patents, we are prepared, under the facilities of our contracts with the WESTERN UNION TELEGRAPH CO., to extend our system of COMMERCIAL REPORTS and PRIVATE LINES to all parts of the UNITED STATES.

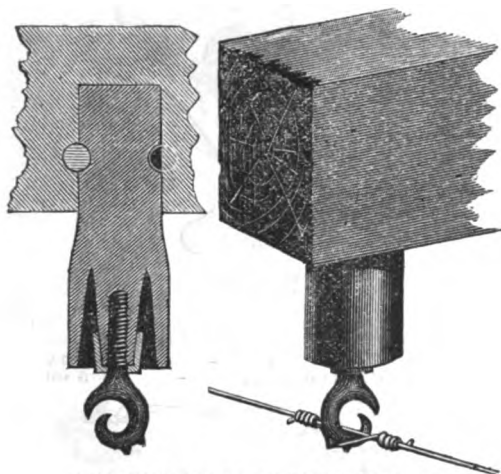
General Offices, No. 195 Broadway, New York.

MARSHALL LEFFERTS, Pres.  
GEORGE B. PRESCOTT, Vice-Pres.  
HENRY H. WARD, Sec. and Treas.  
GEO. B. SCOTT, Supt.



## THE KENOSHA INSULATOR CO.

Telegraph Companies and Telegraph Constructors are invited to examine the merits of our new and improved patterns of



### KENOSHA CARBON INSULATORS!

These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellant of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of SIX YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average, MORE THAN TEN TIMES AS GREAT

during the prevalence of rain or fog.

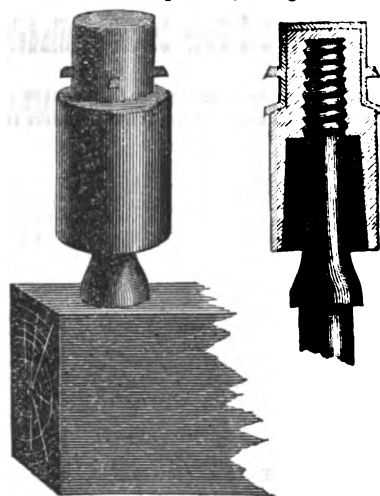
Immense numbers of these Insulators are in use by

**The North Western Telegraph Co.,**

**The Western Union Telegraph Co.,**  
as well as many RAILWAY and OTHER TELEGRAPH LINES, and they have invariably been found to give

### ENTIRE SATISFACTION.

Besides the Suspension Insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



**CAP INSULATOR, WITH PIN OR BRACKET,**  
which is fitted with a zinc protection, as shown in the above figure,

### THE KENOSHA INSULATOR

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice,

**CROSS-ARMS** for any REQUIRED NUMBER OF WIRES, prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all Insulators furnished by us to prove entirely satisfactory.

**THE KENOSHA INSULATOR CO.,**

KENOSHA, WIS.

**L. G. TILLOTSON & CO.,**

8 Dey St., New York,

GENERAL EASTERN AGENTS.

**THE WESTERN ELECTRIC MFG. CO.,** of Chicago,

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## JUST OUT! NEW AND ENLARGED EDITION.

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## MANUAL OF TELEGRAPHY,

CONTAINING

**COMPLETE DIRECTIONS FOR SELF-INSTRUCTION IN TELEGRAPHY,**

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**SHORT LINES OF TELEGRAPH,**

**DIAGRAMS FOR SHOWING THE MANNER OF CONNECTING WIRES, BATTERIES, INSTRUMENTS, &c.**

**Descriptions and/Cuts of all forms of Telegraph Instruments, Batteries, etc.**

**CUTS, DESCRIPTIONS AND PRICES OF THE BEST LEARNER'S APPARATUS AND SHORT LINE INSTRUMENTS,**

together with full explanation of everything necessary for the Amateur Telegrapher to know.

Every operator and every learner of Telegraphy should have a copy of this Manual.

It is the most complete, practical and easily understood explanation of the Morse Telegraph and its apparatus ever published.

**Price 30c.**

Sent post paid on receipt of price.

**L. G. TILLOTSON & CO.,**

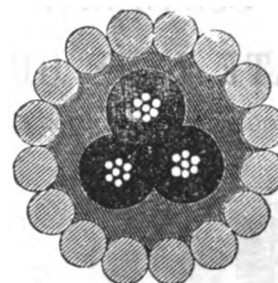
8 Dey Street, NEW YORK.

54 South 4th Street, Philadelphia,

22 West 4th Street, Cincinnati.

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ONLY AMERICAN MANUFACTURER

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# JOURNAL OF THE TELEGRAPH.

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WHOLE NO. 186.

## MEASURING RESISTANCES.

The measurement of the resistance of a given length of wire or of a telegraph line may be performed by various methods, of which sometimes one and sometimes another may be preferable, this depending largely upon the instrument we desire to make use of for measuring purposes. The usual methods are the following :

### THE METHOD OF SUBSTITUTION.

The most simple method of measurement is to include the resistance which is to be measured, together with a galvanometer, in the circuit of a galvanic battery, and observe the deflections of the needle, and then to replace the unknown resistance by another known resistance, for instance, a certain number of ohms or Siemens's units, or by an adjustable rheostat, and then to so adjust the last named resistance that the deflection of the needle of the galvanometer is the same as before. The unknown resistance is of course equal to the known resistance by which it has been replaced.

But this method is seldom available in practice. If the resistance to be measured is very small, then a sensitive galvanometer will be deflected to an angle of nearly 90° and the polarity of the needle may even be reversed. If, on the other hand, we use an ordinary galvanometer, then the deflection changes but very little, after the angle of deflection has reached 30 or 35 degrees. In addition to this, there is danger that the strength of the current may change during the time occupied in making the two measurements.

We may arrive at a more exact result, by employing a differential galvanometer, G, (fig. 1) which is provided with two separate coils, *lm* and *np*, of equal power, but opposite action. The binding screws, *m*, *n*, are connected by means of the wires, *i*, *q*, with one of the poles of the battery, S, while the other two binding screws, *l*, *p*, are connected on one side with the screw *o*, and on the other side with a resistance coil or a rheostat, R. The other pole of the battery is connected with the binding screw *o*, *o*<sub>1</sub> as well as with the same rheostat, R.

Now, in order to determine the resistance of the wire ABC, we may connect the extreme end, A, to *o*, and C to *o*<sub>1</sub>, and adjust the resistance of the rheostat, R, so that the needle of the galvanometer will stand at zero. As the two opposing coils of the galvanometer are never exactly equal in their action upon the needle, the resistance of rheostat R is not, strictly speaking, equal to the resistance of the wire ABC.

We may, however, remove the wire ABC, and substitute therefore another rheostat, R<sub>1</sub>, connecting *a* with *o* and *b* with *o*<sub>1</sub>. If we now adjust the rheostat, R<sub>1</sub>, so as to cause the needle S to return again to zero, then the resistance inserted by means of R<sub>1</sub>, which we may read off on the instrument, is evidently equal to the unknown resistance of the wire ABC.

When one of the ends of the wire, for instance C,

is connected with the earth, then we must also connect *o*<sub>1</sub> with the earth and proceed in the same manner as before. In this case, however, it is necessary to take into consideration the fact that earth currents or currents of polarization may render the measurements inaccurate. The effects of the latter may be

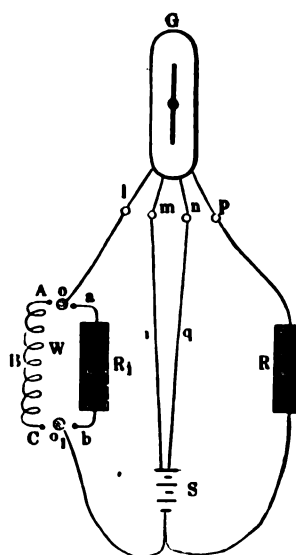


Figure 1.

avoided by making the measurements very quickly, so as to not to give the earth plates time to become polarized.

The preceding method is evidently not applicable in cases where the resistance, ABC, is so large that

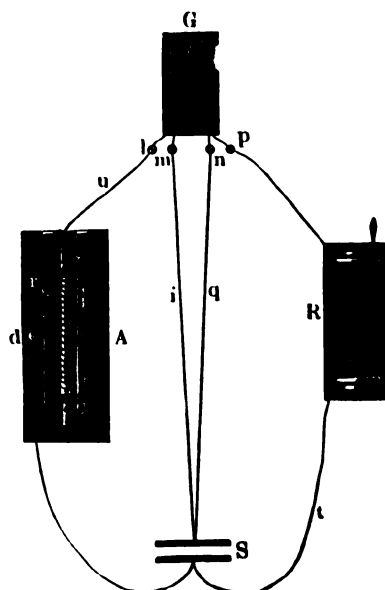


Figure 2.

the rheostat wire required for its measurement is insufficient, and larger resistance coils are not available. Hence, it cannot be used to determine, for ex-

ample, the resistance of the insulating coating of a submarine cable, when the cable itself is only a few miles in length. This will be referred to hereafter in connection with the subject of submarine lines. It is only desired, in this place, to mention the general fact, that in cases of this kind a galvanometer may be used, which consists of two coils of opposite direction, but differing in respect to the number of convolutions in each coil. For example, one coil may have 100 turns and the other 1,000. In this case the former requires a current 10 times as strong as the latter, to produce the same effect upon the needle. The resistance in the former coil should also be only one-tenth that of the latter, the battery being the same for both coils.

It is true that the relation of the strength of current is not exactly in proportion to the number of convolutions in the galvanometer, as both coils have not exactly the same effect upon the needle ; but by means of a preliminary test, the relative strength of the two currents which has an equal action upon the needle may be easily determined.

Let *g* (fig. 1) represent the resistance of the coil situated between *n* and *p*, and *g*<sub>1</sub> that of the coil situated between *l* and *m*, and suppose two graduated rheostats, R and R<sub>1</sub>, (removing ABC) to be inserted in the two currents, and so adjusted that the needle of the instrument stands at zero. If we indicate the resistances which are added by means of the rheostats, by R and R<sub>1</sub>, and the strengths of currents which flow in both circuits respectively by S and S<sub>1</sub>, then the latter are in an inverse relation to the resistances *g* + R and *g*<sub>1</sub> + R<sub>1</sub>, which we find in the circuits ; hence we have

$$\frac{S}{S_1} = \frac{g_1 + R_1}{g + R}$$

If we replace the resistances R and R<sub>1</sub> by two others, *r* and *r*<sub>1</sub>, then these would also cause no deflection of the needle, for the reason that the new strengths of current, *s* and *s*<sub>1</sub>, stand in the same relation to each other as S and S<sub>1</sub>. Now, however,

$$\frac{s}{s_1} = \frac{g_1 + r_1}{g + r};$$

hence no deviation of needle takes place when

$$\frac{g_1 + r_1}{g + r} = \frac{g_1 + R_1}{g + R}$$

The latter relation, however, may be determined, once for all, by a preliminary test ; we will call it the coefficient of the instrument and indicate it by K.

Now, in order to determine with the aid of such an instrument, the resistance W, of line ABC, which is very considerable, (fig. 1) we insert it between *o* and *o*<sub>1</sub>, adjusting the rheostat R so that the needle in *g* will stand at zero. Now, if we indicate by *ρ* the resistance of rheostat R, (which resistance we find in the right hand circuit), then we have, when the needle stands at zero,

$$\frac{g_1 + W}{g + \rho} + K$$

or

$$W = K(g - \rho) - g_1$$

now,  $K, g, g_1$  and  $\rho$  are known resistances; hence, by them we are able to determine the resistance  $W$  of the line  $ABC$ .

In many cases, as for example, when testing submarine cables, we may neglect the resistance of the galvanometer when its resistance is small in comparison with that of the circuit measured; we have, then,

$$W = K\rho.$$

With this method, by which we may find the resistance sought by another 10, 100 or 1,000 times smaller, it is easy to exclude the influence of earth-currents, which may appear when one end of the resistance to be measured ends in a ground plate. To do this, the battery is removed, and the wires  $i$  and  $q$  connected directly with each other, and with  $o$ , and  $r$ , at the same time another earth connection is made at  $o$ . If an earth current is present, and deflects the needle at  $G$ , we have only to place a small steel magnet near  $G$  in such a manner that the needle again stands at zero, the influence of the earth current being thus compensated by the magnet. But even this is not strictly necessary; we may consider the degree over which the needle stands under the influence of the earth-current, as zero mark, a position corresponding to the state of rest of the needle.

If the rheostat resistance is insufficient to determine the very considerable resistance to be measured, we may insert two batteries of unequal strength but of like elements, in both circuits. If we place in one battery, whose current circulates in the smaller coil of the galvanometer, and of the rheostat, for instance, 10 elements, and to the other battery, in whose circuit is included the larger coil, and the resistance to be measured, 120 elements; the latter circuit having 12 times the battery power, requires 12 times as much resistance in order that the current may have the same effect on the needle, as the current from the smaller battery.

Hence, if we retain the same value for the respective resistances, we find,

$$\frac{g_1 + W}{12(g + \rho)} = K$$

or,

$$W = 12(g + \rho)K - g_1,$$

and, when again we neglect  $g$  and  $g_1$ ,

$$W = 12\rho K.$$

Consequently if the galvanometer has two coils, one consisting of 100 convolutions and the other of 10,000 and if we place in the battery circuit with the former coil a battery of 10 elements, and in the circuit of the other coil 120 elements, then the resistance of the rheostat may be about

$$\frac{1}{12 \times 100}$$

of the resistance, which is to be measured. If, 1200

for instance, the resistance coils ( $R$ ) contain a total resistance of 10,000 units, then we may according to the preceding method, measure resistances of  $1,200 \times 10,000$  or 12,000,000 units.

If we have two rheostats, then we may (within certain limits of the resistance to be measured) proceed in the following manner:

We take a differential galvanometer  $G$ , having equally powerful but opposing coils  $l$  and  $n$  (fig. 2). The extreme ends  $m$  and  $n$  are connected by means of the wires  $i$  and  $q$  with one of the poles of the battery  $S$ , the other ends  $l$  and  $p$  respectively with the rheostat  $R$ , and the circuit-closing apparatus  $A$ . The latter serves to put in or take out at pleasure the wire or resistance, which is to be measured (in the

drawing represented as a spiral) in the circuit of battery  $S$ . For this purpose we connect a wire  $k$ , from the battery pole to a mercury cup  $d$ ; a movable wire  $r$  connects this with another mercury cup  $o$ , and the latter, by means of the wire  $n$ , is in connection with the binding screw  $l$  of the galvanometer.

The current from the battery  $S$  now passes through both wires  $i$  and  $q$  to the separated coils of the galvanometer, which are arranged so that the branch currents shall pass around the needle in opposite directions; one of these passes through the rheostat  $R$ , the other, when the wire  $r$ , as represented in the drawing, is connected with  $o$ , through the wires  $u$ ,  $r$  and  $k$ .

Now the rheostat is so adjusted that both circuits offer the same resistance, consequently the strength of the current in each is the same, and the needle of the instrument  $G$  remains in a state of rest, that is, at  $0^\circ$ .

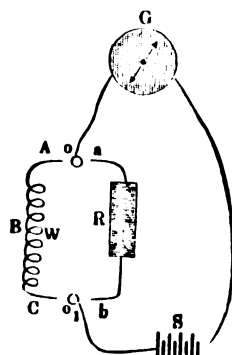


Figure 3.

Now, if we turn the wire  $r$  so as to connect it with  $o_1$ , instead of  $o$ , and place the resistance, which we wish to measure between  $o$  and  $o_1$ , then the part of the current formerly passing directly through  $k$ ,  $r$  and  $u$ , to the galvanometer, must go through  $k$ ,  $r$ ,  $o_1$ , and the resistance which is to be measured, to  $o$ , thence through  $u$  to  $G$ , on account of the larger resistance in the left hand circuit, the current in it will be to the right, and, therefore, the galvanometer needle is deflected by the latter current. Now, if we insert in the right-hand circuit (by turning the rheostat) so much of the rheostat wire, that the needle of the instrument again stands at zero, then we evidently have found in the resistance of the added rheostat wire, the resistance of the piece of wire between  $o$  and  $o_1$ , which we wished to measure.

#### THE METHOD OF COMPENSATION.

This method consists in comparing by means of sine-galvanometer the strengths of current, which

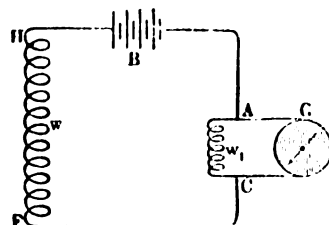


Figure 4.

one and the same battery produces, in two circuits, of which one has a known resistance, and the other the resistance which is to be measured.

Suppose  $a$  represents the resistance of the battery  $S$  (fig. 1) and that of the galvanometer  $G$ ; between  $o$  and  $o'$ , we may insert one after the other the known rheostat resistance  $R$ , and the resistance  $ABC = W$ , which is to be measured. Suppose now, with the rheostat  $R$  inserted that the galvanometer needle gives an angle of deflection  $\alpha$ , and with  $ABC$  inserted the angle  $\alpha_1$ , then the strength of the currents are

proportioned to the sine of the angle of deflection; hence, when  $s$  and  $s_1$ , which are the strengths of current corresponding to the angles of deflection  $\alpha$  and  $\alpha_1$ , then

$$s : s_1 = \sin \alpha : \sin \alpha_1,$$

According to Ohm's law, however, we have also, when  $E$  is the electromotive force of the battery, and  $a$ , the resistance of the battery and the galvanometer:

$$s : s_1 = \frac{E}{a + R} : \frac{E}{a + W} = \frac{1}{a + R} : \frac{1}{a + W},$$

hence is,

$$\frac{\sin \alpha}{\sin \alpha_1} = \frac{a + W}{a + R}$$

Consequently,

$$W = (a + R) \frac{\sin \alpha}{\sin \alpha_1} - a.$$

The resistance  $a$  may be ascertained by a preliminary test;  $R, \alpha, \alpha_1$  are known values. These substituted in the equation determine  $W$ .

When great accuracy is not required, we may neglect the resistance  $a$  of the galvanometer, and battery; we then get

$$W = R \cdot \frac{\sin \alpha}{\sin \alpha_1}$$

as we may take for angles which do not exceed twenty-five degrees, without committing any material error, instead of the sine, the angle itself, hence we obtain, when the angles of deflection  $\alpha$  and  $\alpha_1$ , do not extend beyond this limit.

$$W = R \cdot \frac{\alpha}{\alpha_1}$$

For instance, if we obtain, by inserting a rheostat resistance of  $R = 2,000$  Siemens units, a deflection of  $16^\circ$ , on inserting the unknown resistance  $ABC$ , a deviation of  $7^\circ$ , we have as an approximate value of the resistance:

$$W = 2,000 \times \frac{16}{7} = 4,571 \text{ Siemens units.}$$

When the resistance to be measured is very great compared with the rheostat resistance  $R$ , instead of the above we may use two batteries of an unequal number of elements. For instance, in the first experiment, where we insert the rheostat  $R$ , we take  $n$  elements, and in the second experiment, after having inserted the resistance  $ABC$ , we take,  $n_1$  elements, then we get, when  $E$  represents the electro-motive force,  $w$  the resistance of an element, and  $g$  the resistance of the galvanometer:

$$\sin \alpha : \sin \alpha_1 = \frac{nE}{nw + g + R} : \frac{n_1E}{n_1w + g + W},$$

or, under the condition that  $\alpha$  and  $\alpha_1$  do not exceed  $25^\circ$ , and the battery and galvanometer resistance may be neglected in comparison with  $R$  and  $W$ ,

$$\alpha : \alpha_1 = \frac{n}{R} : \frac{n_1}{W},$$

hence,

$$W = R \cdot \frac{\alpha}{\alpha_1} \cdot \frac{n_1}{n}.$$

For instance, if  $n = 10$ , and  $n_1 = 120$  elements, then,

$$W = 12 \times R \times \frac{\alpha}{\alpha_1}$$

and on the supposition that  $R = 2,000$  Siemens units,  $\alpha = 16^\circ$ ,  $\alpha_1 = 7^\circ$ ,

$$W = 12 \times 2,000 \times \frac{16}{7} = 54,857 \text{ Siemens units.}$$



When we change the number of elements in a battery, the electromotive force does not remain unchanged; although in general, it cannot be said to be strictly proportional to the number of elements. Now, in order to reduce the sensibility of the galvanometer for a certain battery, we may treat it in a different way.

Let fig. 4 represent the battery,  $H F = w$ , the resistance to be measured,  $G$  the galvanometer. By inserting a known resistance  $w_1$  between the wires  $A$  and  $C$ , which lead to the galvanometer, we form a shunt of known resistance, and the current divides itself between the coils  $A B C$  of the galvanometer and the inserted branch  $w_1$  so that only a part of the current generated by the battery passes through the galvanometer.

If we indicate the resistance of the galvanometer coils by that of the shunt circuit  $w_1$ , the current passing through the galvanometer by  $s$ , and the current which flows in the undivided wire from  $B$  to  $A$  by  $S$ , then

$$s = S \cdot \frac{w_1}{w_1 + G}$$

Now, if we make  $w_1 = \frac{1}{99} \cdot G$ , then the current

passing through the galvanometer is

$$s = \frac{1}{100} \cdot S.$$

Hence the battery  $B$  acts with only  $\frac{1}{100}$  of its force on the galvanometer  $G$ .

It is true that by inserting the resistance  $w_1$ , the strength of the main current is somewhat augmented. When, however, the resistance of the circuit is very considerable, the shunt has but little influence upon it.

#### NEW SPEED INDICATOR.

M. Brunot, inspector of traction on the Northern Railway of France, produced some time since a new speed indicator and controller intended to supersede the ingenious but complex instruments of Adam, Taylor, Bréguet and others; the apparatus was well spoken of, and is being applied on the lines in question. At the request of the inventor, the Industrial Society of Amiens appointed a commission of six members of its mechanical committee to examine and report on the controller in question. The commission appointed M. Vron reporter. After a historical sketch of the known instruments and an exposure of the difficulties which surround automatic telegraphic action, M. Vron says: "The security of passengers, as well as the economic use of the material of the line, demand that the course of each train should be precisely known, with all the circumstances of stoppages, arrival, departure, etc., so that the progress of any train should be precisely shown, minute by minute, and at every point of the route." Telegraphic communication is not applicable to the recording of changes of speed, or the good or bad working of engines, or of their movements in stations. The check by time is insufficient, and may even induce one of the greatest causes of danger, that is to say, excessive rapidity to fetch up time lost.

MM. Guehard and Fronchon have also invented a similar instrument, which is being applied on the eastern road of France. These inventions were almost simultaneous, and are nearly on the same principle, which is very simple; one takes the advantage of the trepidation of the train when in mo-

tion, and the other of the same trepidation in connection with the oscillation of the pendulum, to magnify the irregularities, otherwise almost invisible, and to trace them on a sheet of paper. In other respects their construction differs, but at present we have only to deal with that of M. Brunot.

The instrument is contained in a small portable box, which may be placed on the engine itself, on the tender, or better still, in one of the brake carriages, so that the guard may see the progress of the train at a glance. Within is a chronometer movement, and on the arbor of the hour hand, which protrudes beyond the box, is placed a disc of thin card the limb of which is divided into hours and minutes, and large enough, with a little practice, to allow of reading of half minutes. The card turns with hand. The edge is all free except at one point where the limb is divided, and is in contact with a metal plate. In this plate is a slit, and opposite to it a pencil of silver alloy. At the moment of starting the card is set to this point. The pencil moves freely in a groove which above turns off at a right angle. At the extremity of the groove is a small weight, suspended by a piece of delicate spring, which at every oscillation strikes the pencil and forces it along the groove, and the paper is marked with points so close that they form apparently a continuous line. When the train stops the pencil ceases to mark the paper, and consequently the duration of the stoppage is recorded; in like manner every change in speed, and even the shock of the buffers meeting together, is shown in the irregularities of the lines. The pencil does not describe a circle, but a spiral, so that the card gives place to eight revolutions and acts for eight times twelve hours. The report says that the apparatus in question is applicable to many other purposes, such, for instance, as that of a tell-tale, the watchman or other person having a key which enables them to move the pendulum at given times. An advantage is claimed for it, amongst others, that it can be moved from place to place without difficulty, and that it cannot be tampered with. Another important application is to show the working of machinery and check irregularities.

#### ELECTRIC CONDUCTIVITY OF GLASS.

At a recent meeting of the Physical Society at London, Mr. Wildman Whitehouse described some experiments he had made on the electric conductivity of glass. He employed pieces of thermometer tube about an inch in length, into the bore of which two platinum wires were inserted in such a manner that there was an interval between the points.

In some cases one wire of platinum occupied the entire bore of the tube, and the tube was surrounded on its external surface by a helix of wire of the same metal. In each case the arrangement was introduced into a circuit in which were also placed a Thomson galvanometer and a set of resistance coils.

It was shown that at the ordinary temperature there was no deflection, but that the current passed freely when the glass was heated to redness. The difficulty of making contact with the glass led Mr. Whitehouse to use two test tubes, one inside the other, both containing mercury with which wires of platinum freely communicated. The flame of a Bunsen burner was applied to the outer test tube, and the temperature of metal noted by the aid of a thermometer. In one series of experiments the diameter of the tube was  $\frac{1}{8}$  inch, the length in contact with the mercury about  $3\frac{1}{2}$  inches, and the thickness of the glass one hundredth of an inch. The current was first observed to pass at  $100^\circ \text{C}$ , and as the temperature rose, the amount of deflection increased.

The following are approximate measurements of the resistance of the glass at different temperatures:

	Ohms.
At $165^\circ \text{C}$ . resistance.....	229,500
" $185^\circ$ " " .....	100,000
" $210^\circ$ " " .....	69,000
" $255^\circ$ " " .....	22,000
" $270^\circ$ " " .....	9,000
" $300^\circ$ " " .....	6,800

Prof. Gladstone drew attention to the necessity for ascertaining the nature and composition of the glass.

Prof. Guthrie alluded to the fact that electricity of high tension is freely conducted by glass at a red heat. He also asked whether, as the temperature was raised, a point was reached at which the conductivity began to decrease.

Prof. McLeod pointed out that most of the tubes in which the platinum wires were fixed were of lead-glass, and that the lead had, in most cases, been reduced by exposure to the flame employed and he urged that this fact should not be overlooked in measuring the resistances. He stated that lead-glass is better than other varieties of glass for insulation.

Prof. G. C. Foster asked whether an increased capacity due to the heating might not introduce an error into the measurements of resistance.

Mr. Whitehouse replied that he had only recently commenced the experiments, and promised that the suggestions which had been made should receive due attention.

#### FIGURES PRINTED BY LIGHTNING.

Persons who are killed by lightning stroke are frequently found marked about the body in a peculiar manner, the lines being grouped into semblance of the trunk and branches of a tree. In case the casualty actually happens anywhere in the vicinity of a tree, the ramifications are attributed to some mysterious property of the lightning, which reproduces on the body (as was stated in published instance) "the fibers, leaves and branches with photographic accuracy."

Mr. C. Tomlinson, in a communication to *Nature*, states that the trees have nothing to do with the figures which are produced directly by lightning. The same markings may be found in sheets of crown glass by passing over them the contents of a Leyden jar. The writer, however, mentions a variety of curious phenomena in which horseshoes, metallic numbers, etc., have been found reproduced on the persons of people struck in their neighborhood. Mr. C. F. Varley throws light on these last mentioned cases in giving the record of an accidental observation made during the workings of a Holtz electrical machine, the poles of which were furnished with brass balls about an inch in diameter. Noticing some specks on the ball of the positive pole, Mr. Varley tried to wipe them off with a silk handkerchief, but in vain. He then examined the negative pole, and discovered a minute speck corresponding to the spots on the positive pole. This pole sometimes exhibits a glow; and if in this state three or four bits of wax, or even a drop or two of water, be placed on the negative pole, corresponding non-luminous spots appear on the positive pole. Hence, it is evident that lines of force exist between the two poles, by means of which we may telegraph through the air from the negative to the positive pole. And in explanation of the above cases, in which the lightning burn on the skin is of the same shape as the object from which the charge proceeded, all that is necessary is that the object be + to the horseshoe, brass number, etc., the discharge being a negative one.

NOTES OF A COURSE OF SEVEN LECTURES ON  
ELECTRICITY.

BY PROFESSOR TYNDALL, LL.D., F.R.S.

(Continued from page 117.)

[From the Telegraphic Journal.]

NOTES OF LECTURE III—February 18, 1875.

1. The next discovery throws all former ones into the shade. It was first announced in a letter addressed on the 4th of November, 1745, to Dr. Lieberkühn, of Berlin, by Kleist, an ecclesiastic of Cammin, in Pomerania. He fastened a nail in a phial into which he had poured a little mercury or spirits. On electrifying the nail he could pass from one room to another with the phial in his hand and ignite spirits of wine with it. "If," says he, "while it is electrifying I put my finger or a piece of gold which I hold in my hand, to the nail, I receive a shock which stuns my arms and shoulders."

2. In the following year Cunaeus, of Leyden, made substantially the same experiment. It caused great wonder and dread, which arose chiefly from the excited imagination. Musschenbroek felt the shock, and declared in a letter to a friend that he would not take a second for the crown of France. Bleeding at the nose, ardent fever, a heaviness of head which endured for days, were all ascribed to the shock. Boze wished that he might die of it, so that he might enjoy the honor of having his death chronicled in the Paris Academy of Sciences. The Leyden philosophers stated the conditions necessary to the success of the experiment, and hence the phial received the name of the Leyden phial, or Leyden jar.

3. The discovery of Kleist and Cunaeus excited the most profound interest, and the subject was explored in various directions. Wilson, in 1746, filled a phial partially with water, and plunged it into water, so as to bring the water surfaces within and without to the same level. On charging such a phial the strength of the shock was found greater than it had been before.

4. Two years subsequently Dr. Watson and Dr. Bevis noticed how the charge increased as the area of the non-electric in contact with the outer surface increased. They substituted shot for water inside the jar, and obtained substantially the same effect. Dr. Bevis then coated a plate of glass on both sides with silver foil, within about an inch of the edge, and obtained from it discharges as strong as those obtained from a phial containing half a pint of water. Finally, Dr. Watson coated his phial inside and out with silver foil.

By these steps the Leyden jar reached the form which it possesses to-day.

5. The physiological effect of the shock was variously studied. Graham caused a number of persons to lay hold of the same metal plate, which was connected with the outer coating of the charged jar, and also to lay hold of a rod by which the jar was discharged. The shock divided itself equally among them.

6. The Abbé Nollet formed a line of one hundred and eighty guardsmen, and sent the discharge through them all. He also killed sparrows and fishes by the shock. The analogy of these effects with those produced by thunder and lightning could not escape attention, nor fail to stimulate inquiry.

7. Franklin was twice struck senseless by the shock. He afterwards sent the discharge of two large jars through six robust men; they fell to the ground and got up again without knowing what had happened; they neither heard nor felt the discharge. Priestley, who made many valuable contributions to electricity, received the charge of two jars, but did not find it painful. This experience agrees with my own. In the theatre of the Royal Institution, and in the presence of

an audience, I once received the discharge of a battery of fifteen jars. Unlike Franklin's six men, I did not fall, but like them I felt nothing. I was simply extinguished for a sensible interval.

8. This may be regarded as an experimental proof that people killed by lightning suffer no pain.

9. Franklin held electricity to be a single subtle fluid; electrified bodies he thought possessed either more or less than their natural share of this fluid. Hence the terms *plus* and *minus*, *positive* and *negative*, as applied to electricity. His notion of the Leyden jar was, that whatever might be the quantity of "electric fire" thrown into the jar, an equal quantity was dislodged from the outside. The two coatings of the jar were, therefore, in opposite electrical conditions. These theoretic views led Franklin to the formation of his "cascade battery."

10. Franklin sought to determine the seat of the charge in the Leyden jar. He charged a bottle containing water; dipping a finger into the water and touching the outside coating he received the shock. He was thus led to inquire: "Is the electricity in the water?" He poured the water into a second bottle and found that it carried no electricity along with it.

11. "He then judged that the electric fire must either have been lost in the decanting, or must remain in the bottle; and the latter he found to be true, for filling the charged bottle with fresh water he found the shock, and was satisfied that the power of giving it resided in the glass itself."\* An account of Franklin's discoveries was given by himself, in a series of letters addressed to Peter Collinson, Esq., F. R. S., from 1747 to 1754.

12. By rendering the coatings of the Leyden jar movable, the jar may be charged, the interior coating removed, placed on the ground and proved unelectric. The jar may then be removed from the outer coating, and the latter proved unelectric. Restoring the jar and coatings, on connecting the two latter, the discharge passes in a brilliant spark.

13. As experimental knowledge increased, thought became more definite and exact as regards the relation of these electrical effects to thunder and lightning. The Abbé Nollet thus quaintly expresses himself: "If any one should take upon him to prove, from a well connected comparison of phenomena, that thunder is, in the hands of Nature, what electricity is in ours, and that the wonders which we now exhibit at our pleasure are little imitations of those great effects which frighten us, I avow that this idea, if it was well supported, would give me a great deal of pleasure." He then points out the analogies between both, and continues thus: "All those points of analogy, which I have been some time meditating, begin to make me believe that one might, by taking electricity as the model, form to one's self in relation to thunder and lightning, more perfect and more probable ideas than what have been offered hitherto."†

14. These views were prevalent at this time, and out of them grew the experimental proof by Franklin of the substantial identity of the lightning flash and the electric spark.

15. But before entering further on the facts of electricity, it will be well to seek some theoretic guidance. The insufficiency of the facts of observation to appease the desires of the mind has been already mentioned. In the midst of facts we long for principles to connect them, and to present them in their proper relations.

16. Accordingly, side by side with the phenomena hitherto illustrated there ran a vein of speculation, more or less vague, as to the nature of electricity itself. In thus speculating we quit the field of observation, and draw upon the constructive imagination, which, guided

by existing knowledge, forms the physical principle, and commits it to the process of experimental deduction to test its sufficiency and truth.

17. Thus, in relation to electricity, Boyle had his unctuous effluvia, Newton his ether, Du Fay his vitreous and resinous electricity, Nollet his affluences for repulsion and his affluences for attraction, Franklin his single electric fluid, and, finally, Symmer his theory of two electric fluids.

18. The simplicity of Franklin's theory of a single electric fluid is only apparent. It involves consequences of a very doubtful kind. In accounting by it for the mutual repulsion of negatively electrified bodies, we are driven to the assumption that ordinary matter is self-repulsive.

19. The theory of two fluids is by far the most convenient. Still, though it is a principle of extreme simplicity and of great power in uniting electrical phenomena, it is to be regarded rather as an image of the mind than as a physical reality.

20. According to this theory, electrical phenomena arise from the action of two fluids, each self-repulsive, but both mutually attractive. Every body in its natural condition possesses both fluids in equal quantities. As long as the fluids are mixed together they neutralize each other; the body in which they are mixed being in its natural or unelectrical condition.

21. By friction, and various other means, the two fluids are torn asunder; the one clinging by preference to the rubber, the other to the body rubbed.

22. As a matter of fact the rubber and the body rubbed are always oppositely electrified.

23. When smooth glass is rubbed with silk the glass is electrified positively and the silk negatively. When sealing wax is rubbed with flannel the wax is electrified negatively and the flannel positively.

24. These terms are adopted purely for the sake of convenience. There is no reason in nature why the resinous electricity should not be called positive, and the vitreous electricity negative. Once agreed, however, to apply the terms as fixed in (23) we must adhere to this agreement throughout.

25. When electricity is communicated to a conductor it distributes itself over the surface; but the mode of its distribution depends upon the form of the conductor.

26. On an insulated sphere it distributes itself equally all over the surface. Riess expresses this by saying that the electric density is the same at all points of an electrified spherical conductor.

27. But this is only true of a sphere. If the conductor be elongated, the electricity is densest at the ends. If it be a cone, different electrical densities are observed at the apex and base of the cone, and on the conical surface. Were the cone perfectly sharp—if the apex ended in a mathematical point, the theoretic density would be infinite. No electricity whatever could exist on such a pointed body; it would be instantly diffused through the air.

28. The more perfect the point of an electrified body the greater will be the electric density, and the greater the tendency to diffusion. By determining the electric density Riess finds the thorn of the euphorbia sharper than an English sewing needle, which, however, excels in sharpness the thorns of the gooseberry, the cactus and the rose.

29. It is the intense electrification of the air at a point and its consequent repulsion that produces the electric wind. It is the escape of the electricity from a point which renders the charging of a conductor on which a needle or other pointed body is placed difficult; it is the copious outflow of electricity which renders it possible by means of a point to convey electricity to bodies at a distance.

\* Priestley's "History of Electricity," 3d Edition, p. 149.

† Priestley's "History of Electricity," pp. 151-52.

30. We have now to apply the theory of electric fluids to the important subject of electric induction.

31. It was noticed by early observers that contact was not necessary to electrical excitement. Stephen Gray, for example, by bringing his excited glass tube near one end of a conductor, attracted light bodies at the other end. Canton, in 1753, suspended pith balls by thread, and holding an excited glass tube at a considerable distance caused them to diverge. On removing the tube the balls fell together, no permanent charge being imparted to them. Such phenomena were further developed by Wilcke and *Æpinus*; while Coulomb's measurements and Poisson's calculations extended and defined our knowledge of the subject.

32. These and all similar results are embraced by the law, that when an electrified body is brought near an unelectrified one, the neutral fluid of the latter is decomposed; one of its constituents being attracted, the other repelled. When the electrified body is withdrawn, the separated electricities flow again together and render the body unelectric.

33. This decomposition of the neutral fluid by the mere presence of an electrified body is called *induction*. It is also called electrification by *influence*.

34. If, while it is under the influence of the electrified body, the influenced body be touched, the free electricity (which is always of the same kind as that of the influencing body) passes away, the opposite electricity being held captive.

35. On removing the electrified body the captive electricity is set free, the conductor being charged with electricity opposite in kind to that of the body which electrified it.

36. Numberless of other experiments are suggested and explained by the principle of induction. It explains why neutral bodies are attracted by electrified bodies. In reality the bodies attracted are *not* neutral: they are electrified by influence; and it is in virtue of their being thus electrified that they are attracted.

37. It explains the "discharge" of an electrified conductor by a point. For the induced electricity becomes so dense upon the point that it streams out against the inducing body and rapidly neutralizes it.

38. It explains the fact that when a point upon an insulated conductor is turned towards an electrified body, the conductor charges itself with the same electricity; and that when the point is turned away from the electrified body the conductor charges itself with the opposite electricity. In the first case the unlike electricity is *drawn* away by attraction; in the second case the like electricity is *driven* away by repulsion.

39. It explains the first approach and subsequent retreat of the gold leaf noticed by Du Fay. For the edges and corners of the leaf, acting like points, discharge the opposite electricity against the influencing body. The leaf being thus rapidly charged with electricity of the same kind as that of the influencing body, repulsion is the consequence.

40. There is also a discharge of the electricity similar to that of the influencing body from the more distant portions of the leaf, to which that electricity is repelled. Both discharges are accompanied by an electric wind. It is possible to give the gold leaf a shape which shall enable it to float securely in the air by the reaction of the two winds issuing from its opposite ends.

41. Well pointed lightning conductors when acted on by a thunder cloud behave in the same way. The opposite electricity streams out from them against the cloud.

42. Franklin saw this with great clearness, and illustrated it with great ingenuity. The under side of a thunder cloud, when viewed horizontally, he observed to be ragged, composed of fragments one below the other, and sometimes reaching near the earth. These he re-

garded as so many stepping stones which assist in conducting the stroke of the cloud. To represent these by experiments he took two or three locks of fine loose cotton, tied them in a row, and hung them from his prime conductor. When this was excited the locks stretched downwards towards the earth; but by presenting a sharp point erect under the lowest bunch of cotton, it shrunk upwards to that above it, nor did the shrinking cease till all the locks had retreated to the prime conductor itself. "May not," says Franklin, "the small electrified clouds, whose equilibrium with the earth is so soon restored by the point, rise up to the main body, and by that means occasion so large a vacancy, that the grand cloud cannot strike in that place?"

#### EXPERIMENTS IN LECTURE III.

1. Early forms Leyden jar illustrated. A small phial, two-thirds filled with water, with a cork in the neck, and a nail long enough to reach the water through the cork; a similar phial two thirds filled with shot. Clasp either phial with one hand, and charging it, a smart shock is experienced when the nail is touched with the other hand. In this and other experiments a rubbed glass tube suffices to charge the jar, though this is more rapidly done by the electrical machine.

2. Water in wide glass vessel; a second glass vessel immersed in the first, and filled to the same height with water. Outer water connected by a wire with the earth; inner water connected by a wire with the electric machine; one or two turns furnish a sufficient charge. Removing inner wire and dipping one finger into the outside, and the other into the inside water, a smart shock is experienced. Placing in the inner water a metal stem and knob, and charging strongly, a brilliant spark passes, on connecting the earth wire with the knob.

3. Glass jar coated (not too high) with tin foil; filled to the same height with water, placed on India-rubber cloth, and charged by connecting outside coating with the earth, and the water (by means of a cemented stem and knob) with an electric machine. Bright spark on discharging. Recharge. Taking hold of jar with India-rubber, pour fresh water into first jar; retention of charge shown by brilliant spark. Edge of jar out of which water is poured to be surrounded by a band of bibulous paper to catch final drop.

Note.—"Carriers" formed of pieces of copper paper, with shellac or ebonite handles, are very useful.

4. Jar with movable coatings charged. Touch knob with carrier—it attracts lath balanced on egg. Remove inner coating and place it on table; the small amount of electricity which it carried away is thus discharged, and the knob now shows no power of attraction. Remove glass vessel; the outer coating is also found neutral. Restore glass and inner coating; lath immediately attracted by carrier which has touched restored knob. Discharge jar: a brilliant spark.

5. Glass plate 9 inches square; tin foil on both sides 6 inches square. Connect one side with earth and the other with machine. Charge and discharge; a brilliant spark.

6. Ordinary Leyden jar; charged and discharged.

7. An elongated metal conductor, or one formed by coating wooden roller with tin foil, is supported on warm glasses or by a glass pillar: small weight suspended by silk ribbon placed on one end: excited glass tube placed over the other end. Weight now removed is charged with electricity and attracts lath. This is the experiment of *Æpinus*.

8. Sphere of wood coated with tin foil: placed on warm tumbler: excited glass tube brought near: touch distant part of sphere with carrier: it attracts lath. Touch surface adjacent to excited tube, it also attracts

lath. The first charge repels, excited glass needle, and is therefore positive; the second repels excited gutta percha, and is therefore negative. One of these charges, moreover, neutralizes the other in the gold leaf electroscope.

9. While the glass tube is near the sphere, touch the latter anywhere with the finger, then touch distant part of sphere with carrier: no action. Now remove glass tube and touch again with carrier: strong action. The electricity liberated by the removal of the tube proves to be negative.

10. Two insulated spheres are caused to touch; excited glass rod is held near one of them and they are then separated. The one is now charged with positive, the other with negative electricity.

11. I stand on an insulated stool: present the right hand to the balanced lath, and stretch out the left arm. An assistant brings excited glass tube over that arm, lath immediately follows hand.

12. I touch the lath and all "virtue" disappears (the lath is not insulated). After this, as long as the excited tube is held over the arm there is no attraction: on its removal attractive power is restored. Here the first attraction was by positive electricity driven to the hand, and the second by negative electricity liberated by the removal of the glass rod. The one repels rubbed glass, the other repels rubbed gutta percha; and on charging the electroscope with both they neutralize each other.

13. I stand on insulating stool, and place the right hand on electroscope: no action. I stretch forth the left arm and permit an assistant alternately to bring near and to withdraw an excited glass tube. The gold leaves open and collapse in similar alternation. At every approach positive electricity is driven over the gold leaves; at every withdrawal the equilibrium is restored.

14. In all cases the rubber, whether it be of silk or of flannel, attracts balance lath. The silk rubber repels rubbed gutta percha, and is, therefore, negative; the flannel rubber repels rubbed glass, and is, therefore, positive. Laying silk rubber on electroscope, leaves diverge. Laying flannel rubber on silk one, leaves close again; the one rubber neutralizes the other, and each of them in relation to the body it has rubbed is oppositely electrified.

#### TWISTING IRON BY ELECTRICITY.

The remarkable phenomenon, first observed by Professor Gore, which consists in the very perceptible twisting of a bar of iron by the joint effects of currents of electricity passing longitudinally through and also around such a bar by means of the insulated wire of an enveloping helix has been further investigated. Subsequent experiments have shown that such twisting may be made to reach fully one quarter of a revolution. It has also been ascertained that both currents are necessary to the development of the phenomena. Either current, when applied separately, simply produces the effects of magnetizing the bar. The direction of the twist is definitely related to the direction of the current in the helix. In order to produce the fullest effect, the current must be simultaneous. When they are successive, a perceptible twist results in a lesser degree.

From Ottawa, Ont., we learn that the articles of a Convention between the postal departments of Canada and the United States establishing an exchange of money orders between the two countries are gazetted. They propose that money orders payable in the States shall be issued at the money order post offices of the Dominion on and after the 2d of August next, for sums not exceeding \$40 Canada currency.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, August 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Cooper, Ala., reopened, square, 286.  
Lorway, C. B. I., closed.  
Schooner Pond, C. B. I., closed.  
Los Banos, Cala., reopened.  
Mabon, C. B. I., reopened (W. U. Office), tariff, 30 cents more than Port Hastings, check direct.  
Milton, Ill., changed to Humbolt.  
Union Mills, Ind., closed.  
Brainard, Iowa, closed.  
Garfield, Kas., closed.  
Fort Point, Me., (summer office on O. L.) reopened, tariff for O. L. 25 1 from Stockton.  
Cockeysville, Md., reopened, square 85.  
Kennedysville, Md., reopened as a W. U. Office in square 67, check direct.  
Morton's, Miss., reopened.  
Lone Tree, Neb., changed to Central City.  
Demarest, N. J., reopened, square 41.  
Manahawken, N. J., is now a W. U. Office, in square 47, check direct.  
Mountain Sta., N. J., is also known as Montrose. Messages addressed to Montrose should be checked to Mountain Sta.  
The office at High Bridge, N. J., closes at six P. M. on week days and is not open on Sundays.  
Geddes, N. Y., closed. Messages are delivered from Syracuse. Charges for delivery, 25 cents.  
Hammondsport, N. Y., is now a W. U. Office, square 101 check direct.  
Sea Cliff, L. I., N. Y., reopened, square 33.  
Hillaboro' N. C., closed.  
Rocky Point, N. C., closed.  
The office given in tariff book as Forch, O., should read Torch.  
Goldsboro', York Co., Pa., reopened, square 76, P. O. Address is Eiters.  
Phoenixville, Pa., reopened.  
Messages taken for Houtzdale, Sterling and Moshannon, Pa., are delivered by special messenger from Osceola, Pa., charges for delivery one dollar to each.  
Cacouna, Que. (summer office) reopened.  
Sweetwater, Tenn., reopened.

## NEW OFFICES.

\* Altus, Ark., 50 3 from Little Rock.  
598 Bradford Junction, Col.  
67 Delaware Junction, Del.  
346 Baileyville, Ill.  
327 Heyworth, Ill.  
318 Humbolt, Ill., (formerly Milton.)  
\* Grayson Springs Ky., 50 3 from Louisville.  
\* Campti, La., 75 5 from Minden.  
\* Natchitoches, La., 75 5 from Minden.  
20 Bridgeton, Me.  
85 Parkton, Md.  
409 Hickman, Mo.  
512 Central City, Neb. (formerly Lone Tree.)  
101 Pleasant Valley Wine Cellar, Steuben Co., N. Y.  
33 East New York, L. I., N. Y.  
33 Springfield, L. I., N. Y.  
33 Shelter Island Camp Grounds, L. I., N. Y. (summer office.)  
33 Woodsburg, L. I., N. Y.  
2 Westville, N. S.  
180 Milton, Wayne Co., O.  
232 West Cairo, O., (formerly Cairo.)  
\* Moffatt, Tenn., 50 3 from Cowan.  
496 Luling, Texas.  
\* Lowell, Wash. Ter., 60 130 from Point Elliott.  
\* Snohomich, " 60 130 " "

When notices of places to which messages are delivered from the nearest telegraph office are given, the entry in the tariff book of the names of such places should be made under or near the name of the delivering office, as well as in alphabetical order. For example: Mt. De Chantal, or Female Academy, Mt. De Chantal, should be entered under Wheeling, W. Va., or if there is not space enough for the name, insert an asterisk (\*) after Wheeling and make the entry at the bottom of the page.

## TO SPECIAL "SHEET E." OFFICES.

The tariff to the Pequot House office, in New London, Ct., will hereafter be same as that to New London.  
The tariff to Port Deposit, Md., will hereafter be the same as that to Wilmington, Del.

## ATLANTIC CABLE.

The following changes to places in South America will take effect on and after August 1st, 1875:

From London, for twenty words or less.  
To Montevideo, \$52.25. To Uruguay, except Montevideo, \$53.88. To Buenos Ayres, \$54.38.

Messages for La Plata, except Buenos Ayres, and Chili, should be addressed, "Care Oldham, Buenos Ayres" and the charges to Buenos Ayres only collected. The charges beyond will be collected from the parties addressed.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, July 26, 1875.

To all Transfer Agents:

Mr. G. W. Trahne has removed his headquarters from Louisville, Ky., to Nashville, Tenn.

On August 9, money order offices will be established at the following named points in J. F. Wallick's district:

Bellefontaine, O.  
Muncie, Ind.  
Paris, Ill.  
Union City, Ind.

WILLIAM ORTON,  
President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

New York, July 26, 1875.

## ASSESSMENT No. 76.

17, 23, 46, 55, 65, 91, 136, 138, 139, 140, 148, 215, 328, 334, 344, 346, 352, 371, 372, 466, 468, 469, 470, 471, 475, 514, 516, 560, 617, 642, 690, 717, 764, 800, 943, 1099, 1102, 1144, 1164, 1175, 1193, 1194, 1210, 1234, 1267, 1289, 1292, 1295, 1440, 1532, 1603, 1637, 1653, 1655, 1657, 1672, 1678, 1699, 1708, 1718, 1864, 1953, 1968, 1994, 1996, 1997, 2033, 2040, 2048, 2074, 2075, 2094, 2136, 2147, 2165, 2169, 2178, 2190, 2192, 2233, 2242, 2256, 2258, 2261, 2266, 2289, 2304, 2323, 2318, 2354, 2363, 2380, 2414.

## ASSESSMENT No. 75.

2005, 2103.

## ASSESSMENT No. 74.

1969.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

## BORN.

HARRIS—At South Norwalk, Conn., July 10th, 1875, a daughter to Geo. W. Harris, manager W. U. Tel. Office.

LAWRENCE—At Washington, Guernsey Co., Ohio, June 16th, 1875, a son to S. B. Lawrence, manager W. U. Tel. Office.

OWEN—At Brunswick, Ga., June 10th, 1875, a son to D. G. Owen, manager W. U. Tel. Office.

## MARRIED.

KELLY-HIBLER—At the residence of the bride's parents, Sullivan, Mo., June 17th, 1875, by Rev. A. O. Melvin, C. D. Kelly, of A. & P. R. B., St. Louis, Mo., to Miss Ella V. Hibler.

MASON-WILSON—At the residence of the bride's father, Moberly, Mo., June 8th, 1875, by Rev. Mr. Polk, of Eastern Shore, Md., J. Q. Mason, manager W. U. Tel. Office, to Miss Virginia M. Wilson.

PRETTYMAN-KERN—At St. James, Mo., June 24th, 1875, by Rev. A. O. Melvin, Charles E. Prettyman, of A. & P. R. B., Sullivan, Mo., to Miss Emma Kern, of St. James.

## FRANKLIN TELEGRAPH COMPANY.

At an adjourned meeting of the Franklin Telegraph Company, held in Boston, July 15th, Alfred Nelson of New York presided. The statement of the Company's finances could not be presented, as it was not ready. The following Directors on the ticket of the New York party were elected: Sidney Dillon, Jay Gould, W. J. Syms, John H. Mortimer, Thomas T. Eckert, Henry M. Taber, Fred. L. Ames, E. T. Atkins, and E. H. Rollins. Messrs. Dillon and Eckert received 7,833 votes, being the whole number cast. The others received 5,544 each. James G. Harris was unanimously re-elected Clerk, and Alfred Nelson was chosen Treasurer, the latter receiving the full New York vote. A preamble was offered reciting that the Atlantic and Pacific Telegraph Company fraudulently assumed the control of the Franklin line, decreased its rates, and injured its business by gross mismanagement. A resolution accompanied the preamble, directing the Directors to bring an action on behalf of the Company, in law or in equity, against the Atlantic and Pacific Telegraph Company. It was lost by a vote of 5,446 to 2,398. Adjourned.

## THE MAINE TELEGRAPH COMPANY.

The annual meeting of the Maine Telegraph Company (whose lines are leased to and form a part of the Western Union Telegraph Company's system) was held at Bangor, June 30, when the following directors were elected: Messrs. Wm. Gallup, Albert Holton, Albert N. Paine, Jacob A. Smith, Bangor, Me.; Edwin F. Littlefield, Winterport, Me.; Hiram O. Alden, Wm. H. Simpson, Belfast, Me.; Bion Bradbury, Wm. P. Merrill, Portland, Me. The board subsequently elected Hiram O. Alden, President, and W. P. Merrill, Secretary and Treasurer.

## ELECTRICITY AND GUNS.

The recent experiments in Prussia in the application of electricity to the discharge of cannon are exceedingly interesting. By means of this invention a number of guns of the heaviest calibre may be discharged simultaneously, the balls all striking the same mark. The experiment was successfully made with four Krupp guns, increasing fourfold their individual destroying force. The introduction of this invention into naval warfare would render iron clads altogether useless. The increase in the weight of iron armor for ships of war, though enormous, has barely been sufficient to keep pace with the increase in the calibre of cannon. Guns have been cast which the heaviest iron armor that any ship of war can practicably ever float is barely powerful enough to resist; and it was becoming a question, before these Prussian experiments, whether iron clads were any longer serviceable, since guns were coming into use which they could not resist more effectually than wooden vessels, while on the other hand they were much slower, cumbersome and far more expensive. This new invention tends, therefore, to settle the question. By making guns so powerful that iron-clads must succumb before them, wooden vessels will again come into use; while on the other hand the reappearance of wooden vessels will render such heavy cannon unnecessary, and will in turn do away with them. Thus the invention of these heavy guns and their discharge by electricity may render both entirely unnecessary.

Never store any articles of food or drink in old petroleum barrels. They are poisonous even after being cleaned.

## CORRESPONDENCE.

HIGH BRIDGE, N. J., July 24, 1875.

*To the Editor of the Journal of the Telegraph :*

Your article on battery covers in JOURNAL of July 1st, induces me to speak a word in favor of "oil," to prevent evaporation in the gravity battery.

I have a local battery of 2 cups, standing in the window of my office that was set up April 24th last. I set the battery up entirely new, putting about two pounds of bluestone in each cup, and after adjusting everything poured about one quarter inch of cotton seed oil over the top. Since that time I have not touched the cups, put no water or anything else in, and to-day the cups are as clean as the day they were set up. There is no smell of oil about the place, the zincs are not even discolored, the water in the cups is clean, of a light transparent blue, and the bluestone is not more than half consumed. Thus, I may expect my battery to run as long as it has already done, or in all—five months without being touched. If you can beat that with covers, I would like to see it done. At the slow rate the zincs have consumed they will be good for at least one year. If this success can be achieved on a large scale the company can afford to reduce tariff again.

MANAGER.

*To the Editor of the Journal of the Telegraph :*

Will you please give your opinion as to the following points on which I am in doubt:

\* A person calls at my office and sends a telegram desiring information as to the correct delivery. Rule 13 requires that in such case the signal "34" will be sent with the message, but don't state the place where correct to insert that signal in a message.

Now, some say the proper place is to insert it after the check; some are of the opinion the right place is after the signature; some others again place it after the address, and there is where I inserted it. This signal should anyhow be understood at any of the above mentioned places, and this is, I think, why there is no place given in Rule 13. That message I sent was of importance, but I did not get the required information.

What is your opinion of this? In early responding you will oblige.

G. Office.

*Answer*—The signal should be sent after the check. Nothing whatever should be interpolated in the body of a message.

*To the Editor of the Journal of the Telegraph :*

Suppose a message is sent to operating room by receiving clerk, checked "30, paid, 240." When operator sends message he finds it contains forty words, and changes the number of words to forty but does not change the amount paid. Message passes through book-keeper's hands without his noticing change, and error does not turn up for four or five months, when settling with New York office, and receiving clerk is charged the difference.

I think sending operator has no more right to change the check than he has to change the reading of any message and that he should have treated message same as one received from a way office, that is, send it back to the receiver, and that he made himself liable for balance when he changed check. Please give your opinion as to who should be held for the difference, the receiver or operator?

*Answer*—The party making the error is responsible, not the one who detects it.

BOSTON, June 28, 1875.

*To the Editor of the Journal of the Telegraph :*

We have heard that it was impossible to make two sounders, placed at opposite ends of a line, receive two different messages at the same time, using three wires and one battery. Is this correct? Now, if a plan could be devised by which this would be brought about, would it be any advantage over the duplex? The instrument would be of the old pattern but the line would require an additional wire. Will you have the kindness to give us your opinion on the subject and let us know if you think it would be worth while to make the attempt.

CROSBY BROS.

*Answer*—This plan was used in the early days of the electric telegraph and is described in Vail's book, published in 1845.

*To the Editor of the Journal of the Telegraph :*

Can a blast be made with electricity? If so, please answer through JOURNAL and say how many cups and what kind would it be necessary to use in blasting quartz rock.

OPERATOR.

*Answer*—Electricity can be employed to ignite the powder or blasting material used. Nothing more.

*To the Editor of the Journal of the Telegraph :*

A party came to my office and wanted me to tell him if, on a certain day, there was sent a message to another party, and who sent it; also, what the contents were.

I told him it was against the rules to reveal anything whatsoever about messages.

He said I might have to as I might be brought before a Court and put under oath to tell what I knew about it.

In case I should, have I a right to tell? Please answer through JOURNAL. W.

*Answer*—You should furnish no information whatever upon the subject except in accordance with the rules. See Executive Order No. 147.

*To the Editor of the Journal of the Telegraph :*

Being about to put up two short lines I intended having one ground wire for each line, but in speaking to another operator, he said one terminal ground wire would do for both lines. Will you please say in next JOURNAL if this is correct, and oblige?

JAMES T. REEDY.

*Answer*—It is correct.*To the Editor of the Journal of the Telegraph :*

Should messages, sent on account of half rate franks, be written on black or red blanks. Has the JOURNAL ever given directions to have them written upon red blanks? X. X.

*Answer*—They should be written upon black blanks. The JOURNAL has not directed otherwise.

## THE WESTERN UNION BONDS.

THE subscriptions for the Western Union Telegraph bonds amounted to about \$4,700,000 at 95. The bonds run 25 years from May 1, 1875, with 7 per cent interest, payable May and November. They are convertible, until May 1, 1885, into Western Union stock; and they have an annual sinking fund of 1 per cent, which will be invested in bonds by yearly drawings, at par, but holders of drawn bonds are not obliged to accept payment before maturity, if they do not choose to do so.

## NEW ABSOLUTE GALVANOMETER.

An absolute galvanometer is described by Professor Guthrie, as constructed for him by the Messrs. Elliott. Its principle depends upon the computation of the strength of the current by the measurement of the mechanical force necessary to bring to a given distance from one another two electro-magnets, which are affected by the current in such a fashion that they repel one another. The galvanic current whose force is to be measured coils around two fixed soft iron masses, rendering them magnetic, and then around two movable soft iron masses suspended by a vertical thread. Many of the laws of electro-dynamics may be readily illustrated by this instrument, and not only may different currents be compared with the greatest accuracy, but the absolute mechanical value of the current may be at once arrived at.

## THE TELEGRAPH CONFERENCE.

The International Telegraph Conference at St. Petersburg has adopted the Russian proposal that short advices up to ten words in length shall henceforth be forwarded at three-fifths of the charge for full messages. The messages despatched under this privilege must not be in cipher. The Russian proposal was intended as a compromise between the two extreme views, one represented by the Indian telegraph lines and private companies, that every word should be charged for separately, and the other held by the government departments that twenty words should be retained as the minimum length of messages.

ANGLO-AMERICAN TELEGRAPH.—An interim dividend of 1½ per cent. free of income tax, for the quarter ending the 30th June has been declared, payable on the 1st of August, leaving a balance, including £32,000 worth of spare cable, of about £67,000. The registers of transfers of the company was to be closed from the 1st to the 5th of July, both inclusive.

A circular issued by the directors of the Direct Spanish Telegraph Company congratulates the shareholders on the satisfactory progress of the company's business. The accounts for the half-year ending June 30th, show profits sufficient to pay a dividend for the past half-year at the rate of 5 per cent. per annum on the ordinary shares, after providing all interest on preference shares up to that date. All quarterly balances up to 1st March last have been regularly received from the Spanish and French Governments. Both the company's cables continue in excellent working order.

A telegram from Scinde, dated Thursday last, states that a bill has been introduced in the legislative council of India to amend the telegraph law, with the object of giving Government the power to make rules under the existing Act.

The steamer International, with a part of the cable on board, was at Arica, at last advices, and the Peruvian transport Chalaco was busy sounding along the coast from Chorillos to Caldera for the laying of the cable.

The net profits of Reuter's Telegram agency for the year ended December, 1874, after payment of current charges, were £6,329, including £244 brought forward. A dividend of 8s. per share is now recommended, in addition to the interim dividend of 2½ per cent. paid in October last, making 7½ per cent. for the year.

The total number of messages forwarded from postal telegraph stations in the United Kingdom during the week ending June 26, 1875, was 408,441—an increase on the corresponding week last year of 17,254.

# Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

## TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, AUGUST 1, 1875.

Managers of offices are reminded that messages offered under half rate franks should be checked and transmitted precisely as though they were full rate messages. Offices sending such business should return the difference between the full rate and the amount actually collected as "uncollected," forwarding the messages with the monthly report as vouchers.

Notice is frequently given through the Tariff Circular that messages for places where there are no offices, are delivered from the nearest telegraph office at a stated charge for each message. The names of such places are entered by managers in alphabetical order in their tariff books and are sometimes lost sight of because messages intended for such places are addressed to the nearest telegraph office instead of direct. For example: To "University of Virginia" which appears in alphabetical order in the tariff book, messages are delivered for 25 cents each from Charlottesville, Va. Messages are sometimes addressed "University of Virginia, Charlottesville Va.," and the rate to Charlottesville only is charged. An order given in Tariff Circular in this issue, directs managers to enter the names of such places as the University of Virginia, under the name of the delivering office as well as in alphabetical order. This, and a little extra care in scrutinizing addresses of messages, will go far to remedy a trouble which bids fair to become serious, and will greatly lessen the number of error sheets now passing between offices on this and analogous cases.

## NOW AND THEN.

In January it was loudly announced that the Atlantic and Pacific were negotiating for 6,000 miles of compound wire, together with a monopoly of all combinations of copper and steel for telegraph conductors. Now it is quietly announced that they are negotiating for a small quantity of plain iron wire, boiled in oil, and don't even ask for a monopoly of the oleaginous and ferruginous compound!

## GEORGE HART MUMFORD.

The cable brings the melancholy and unexpected announcement of the death, in Paris, on Sunday, July 25th, of George Hart Mumford, Secretary and one of the Vice-Presidents of the Western Union Telegraph Company. Mr. Mumford had been in Paris only a few days, having left New York on the Steamer *Cimbria*, July 8th, with the intention of passing a short time on a vacation. At the time of leaving, his health was apparently good, but he complained somewhat of fatigue, from which he hoped to be relieved by a few weeks' rest.

At his death, Mr. Mumford was in the thirty-fifth year of his age. He was born in Rochester, N. Y., and was the only son of the late George H. Mumford, one of the first settlers of that town, and who was, himself, one of the leading officers of the Western Union Company in its early days, being Vice-President, and for a long time, one of the Board of Directors.

For so young a man, the very high business and social standing attained by Mr. Mumford was remarkable. During the past ten years, in connection with the telegraph, he filled some of the most prominent and responsible positions, and always with marked ability. His first important service was in 1864, when but twenty-three years of age, he was sent by the Western Union Company to San Francisco to evoke order out of the chaos in which the affairs of the Russian Extension enterprise were involved. In settling this business he saved to the Company, by his energy and discretion, a large amount of money and property.

He returned East, and in 1865 went back to San Francisco charged with the reorganization of the California State Telegraph Company, a majority interest in which had been acquired by the Western Union Company. This was a matter of great delicacy, beset with embarrassments and difficulties, and requiring much skill and tact to carry through. He was completely successful in this mission, and at their first meeting he was elected President of the reorganized company. This position, as well as that of General Agent of the Western Union Company on the Pacific Coast, he held for nearly five years, during which period nearly all the stock of the California State Company was acquired and the lines merged into the general system of the Western Union. The signal ability and judgment which he displayed in the discharge of these duties were such that he was called to the headquarters at New York and promoted to the position of Secretary of the Western Union Company, and shortly after was elected a Vice-President, to both of which positions he has since been annually re-elected. He was also Secretary of the International Ocean (Cuba Cable) Telegraph Company, and, since February, 1875, General Superintendent of the Eastern Division of the Western Union Company.

Mr. Mumford graduated at Harvard College and Law School with high honors in his class, and for a brief period thereafter practiced law in the office of his uncle, Judge Palmer, in Rochester. He was a

gentleman of rare attainments, an excellent linguist, the possessor of eminent social qualities and a kind and sincere friend. He was a frequent contributor to the current periodical literature; many of the finest political articles in some of the standard weeklies of high character, were the productions of his pen.

Mr. Mumford was married in San Francisco, in the latter part of 1865, to Miss Dana, the amiable and accomplished daughter of Gen. Dana, of the Union service during the civil war. Four beautiful children were the fruit of this marriage, to whom and to the devoted wife the death comes with appalling suddenness and grief. Into the darkness of such a sorrow we cannot enter; none but they can understand its blackness. To his now doubly widowed mother also, and his three sisters, by all of whom he was tenderly loved, Mr. Mumford's death is deeply felt. He was their domestic idol. They had regarded his brilliant career with just pride and delight. He was their counselor in all their domestic arrangements and trials, and their trust in his judgement was absolute. To them, as to his immediate family circle, this bereavement comes with circumstances of unusual sorrow and bitterness.

Outside of the family circle also, Mr. Mumford was highly and widely esteemed. He was a most valuable executive officer, fulfilling his varied and exhausting duties with rare skill, completeness and fidelity. He had the most perfect confidence of his associate officers, by all of whom he was beloved and admired. By them, especially, will his loss be deeply felt.

The remains will be immediately brought to this country for interment.

## WHAT IS THE MATTER?

The Direct Cable is not yet in operation, nor has the *Faraday*, which has been out now nearly seven weeks endeavoring to find and repair the fault, been heard from since July 1st, when she was seen by the Allan steamer *Prussian*. It would seem that grave apprehensions exist as to her safety, inasmuch as a vessel has been dispatched from St. Johns, N. F. to search for her. The managers of the concern at London are beset with inquiries from stockholders and others which cannot be answered; meanwhile the price of its shares are constantly receding.

## IMPROVEMENT.

The following figures will serve to show the practical utility of soldering the joints as illustrated by the work now being done on the wires between New York and Washington. The tests were made of the three following numbered wires between Washington and Baltimore, before and after soldering the joints:

	Mileage resistance before soldering.	Mileage resistance after soldering.	Gauge of wire.
No. 41	25.16 ohms.	18.4 ohms.	No. 9.
" 42	49.2 "	16 "	" 8.
" 43	22.58 "	18.40 "	" 9.

Wire No. 42 shows an increase in conductivity by the soldering of the joints of 68 per cent.



## A GRACEFUL ACKNOWLEDGMENT.

On the occasion of the inter-collegiate race at Saratoga, July 14th, some unknown person endeavored, unsuccessfully, to "fool" the American Press Association with a bogus report of its conclusion, using the wires of the Western Union Company for that purpose. An investigation was instituted, which elucidated the facts contained in the following graceful acknowledgment by the New York *Evening Mail*, one of the leading papers of that association:

"With his usual promptness and courtesy in such cases, President Orton, on learning that a bogus report of the Saratoga boat race had been sent over the Western Union wires to the American Press Association, at once offered to cooperate with its officers in investigating the matter. It was discovered that the message was filed by an entire stranger, who, when told that the message was wrong, said that it was a "cipher" and would be understood by its recipients. An effort will be made to discover this party, and to punish him when found. It should be said that, from the outset, no blame was imputed to the Western Union, and even had its agent been at fault his punishment would have been certain. If there is one thing that Mr. Orton prides himself on it is on enforcing on all his employees his own high standards of accuracy, fairness and honesty."

## ACQUIRING LATERAL LINES WITHOUT EXPENSE.

Against the avowed policy of acquiring lateral lines without expense, the holders of the minority of the stock of the Franklin Company are still struggling manfully with the Atlantic and Pacific Company, though the odds are apparently against them. At the recent meeting for the election of directors, a preamble was offered reciting that the Atlantic and Pacific Company had fraudulently assumed control of the Franklin line, decreased its rates and injured its business by gross mismanagement; also, a resolution directing the Directors to bring an action on behalf of the Company, in law, or in equity, against the Atlantic and Pacific Company. This was rejected by the usual vote, the Atlantic and Pacific in the negative and the Franklin affirmative.

## NEW TELEGRAPHIC PAPER.

The *Electrical News and Telegraphic Reporter* is the title of a new weekly periodical, published at London, and edited by Mr. William Crookes, the well known editor of the *Chemical News*, and *Quarterly Journal of Science*. The prospectus, in the first number, that of July 1st, sets forth the aims and purposes of the new publication, which are, in the main, to supply the electrician with a recognized and representative organ, and to make public all that is known or can be learned of electricity in all its branches. There is, probably, no one in Great Britain better qualified than Mr. Crookes to carry out these objects, but we are somewhat doubtful of his ability to demonstrate the last mentioned proposition. Be that as it may, the *News* is a first class telegraphic publication, and will, undoubtedly, have a large circulation.

## MECHANICAL AND ELECTRICAL TESTS OF IRON WIRE.

In a recent number of the JOURNAL the results of a series of tests of different samples of iron wire were given. Since that time a number of additional samples have been tested in the same manner, and the results are given in the subjoined table. For convenience of comparison, the results given in the former table have also been included in this one, and one or two slight typographical errors corrected. An additional column under the head of "Relative Breaking Strain," has been introduced, which has been calculated from the actual breaking strain as given in the fifth column, and the weight per mile as given in the second column, and shows the number of feet of its own length that each sample would be capable of sustaining. The arrangement of the table, it will be noticed, affords an opportunity of comparing in adjacent columns the relative breaking strain and relative conductivity of each sample. The tests are arranged in the order of their relative breaking strain.

Sample Mark and Gauge.	Weight per mile (lbs.).	Mechanical.				Electrical.	
		Per cent. of Elongation.	No. of Twists (6 in.).	Actual Breaking Strain (lbs.).	Relative Breaking Strain.	Percent Conductivity Pure Copper Wire.	Resistance per mile in Ohms at 60° F.
KBB, Galv. No. 12	190.83	11.5	14 1/2	430 406	417.5	11652.3	14.4
KBB, Galv. No. 8	301.66	17.7	24 3/4	946 900	937.5	12090.6	17.3
KBB, Galv. No. 11	223.64	17.3	31 1/2	576 500	577.5	13639.4	18.6
151. No. 9 1/2	262.8	10	26 3/4	760 740	770.	14375.9	31.9
KBB, Galv. No. 10	254.44	17.7	28 3/4	675 730	697.5	14478.1	17.8
146. No. 9 1/2	267.5	16	27 1/2	825 840	832.5	15288.96	21.9
KBB, Galv. No. 6	500.88	11.4	31 1/2	1545 1590	1547.5	16462.4	17.7
KBB, Galv. No. 9	318.05	19.3	17 1/2	1005 1010	1007.5	16725.1	16.9
Nashua " No. 8	301.66	18.1	26 3/4	1510 1540	1525	21162.	14.7
M.S. Plain No. 6	528	10.4	18 1/2	2110 2165	2137.5	21375.	13.5
442 No. 8	378.1	10	27 1/2	1690 1640	1635	22301.4	16.5
A H. No. 9 1/2	293.5	16	27 1/2	1255 1260	1267.5	22636.	15.1

## THE GREAT WESTERN TELEGRAPH COMPANY.

In the Circuit Court at Chicago, Ill., in the matter of Jeremiah Terwilliger et al., vs. The Great Western Telegraph Company, Oliver H. Horton, receiver of the company, a few days since filed his report.

After referring to his former reports heretofore made, the receiver sets forth the condition of the company, and says that at the time of his appointment as receiver there was pending before the master an investigation as to the accounting between Selah Reeve and the Great Western Telegraph Company, which was at that time partially concluded—such accounting having been conducted on the part of the company by Messrs. Harding, McCoy & Pratt, as attorneys. The receiver states that he requested those gentlemen to continue and conclude such accounting before the master. The receiver asserts he is unable to report the amount of the indebtedness of the company, for the reason that a very considerable proportion of such indebtedness is still undetermined, and stands under exceptions to a

number of reports filed by the master, although reports by the master in chancery upon many of such claims have been filed in and approved by the court, whereby a large amount of such claims have been adjudicated to be correct, and allowed. Assuming the indebtedness as reported by the master to be correct, the receiver estimates the indebtedness in round numbers as follows:

Reported by the master, exclusive of Reeve's account—	
ing .....	\$66,000
Bonds .....	23,000
Reeve accounting .....	56,000
Accrued interest, etc., estimated .....	5,000
	<b>\$150,000</b>
To which add amounts to be paid to Western Union Telegraph Company under contract, balance due on master's fees, attorney's and receiver's fees, etc., say .....	20,000
Estimated total .....	<b>\$170,000</b>

The receiver reports that he has no money with which to pay the said indebtedness, and knows of no property or assets belonging to the Great Western Telegraph Company with which they could be paid, except the property mentioned in this report, which are the lines west of the Mississippi river. The receiver sets forth further that he has never received anything for his services, and has never been able to pay any attorney's fees; that the telegraph lines are growing old, and will, from this time henceforth, need quite extensive repairs. From his opinion, he thinks there will be no profit in operating the lines under a temporary administration, such as that of the receiver must of necessity be. In his opinion, a large amount of money will have to be expended in making extensions and advantageous connections, and perfecting and putting into complete order said lines before they can be made to pay. The creditors are clamorous in regard to their pay, and there is no prospect of raising funds to settle with them until a sale of the property shall have been made. For these and various other reasons, the receiver deems it absolutely necessary, and recommends to the court that the lines be sold by and under the order and direction of the court, and that in case of such order, it should be provided that of the proceeds of the sale a sufficient sum should be retained by the court to protect the purchaser at such sale against any valid or subsisting liens, otherwise the sale thereof might be very materially injured to the detriment of the creditors.

The report further sets forth that the receiver has filed exceptions to eleven of the reports of the master upon claims against the company, together with exceptions filed by other parties against the master's report as to their claims—amongst them being those of the company in the matter of the accounting with Reeve, and therefore the receiver prays for specific instructions from the court, directing him in what cases he shall be authorized to employ solicitors.

CHICAGO, July 25th.—In the Cook County Circuit Court yesterday Judge Farwell granted permission to O. H. Horton, receiver of the Great Western Telegraph Company, to sell that corporation at auction on the 1st of October. Mr. Horton, in applying for permission to sell, gave as his reason that the Company could not be operated successfully in its present condition, and that it is losing money.

The Headquarters of the second district of the Southern Division, Geo. W. Trabue, Superintendent, and J. B. Tree, Assistant Superintendent, have been removed from Louisville, Ky., to Nashville, Tenn.

**STUDIES ON ELECTRIC CHRONOGRAPHS AND RESEARCHES ON THE INDUCTION SPARK AND ELECTRO-MAGNETS.**—*M. Deprez.*—The author sought to determine the retardation of the induction spark, i. e., the time elapsing between rupture of the inducing current and the explosion of the spark. Of all methods of registering this is the most rapid, the retardation being generally less than one ten thousandth of a second. But the spark presents disadvantages; its production is very capricious, and depends much on the manner of rupture; it is nearly always multiple, and it thus struck several points of the cylinder (in the arrangement adopted). When the cylinder moved very quickly its trace became very uncertain. A large induction coil is required. And the number of sparks one coil can produce in a second does not exceed two or three hundred. This was insufficient for the author's purpose (which was to find twenty points of a curve representing the pressure of gases of powder in a gun). For he had to produce two consecutive signals at an interval of one ten thousandth of a second. He had therefore to use twenty independent bobbins and twenty batteries. He tried the other processes of electric registration, the use of electro chemical paper, and that of electro magnets. The first was abandoned as inferior to the induction spark, the second he succeeded in improving till he could measure the duration of a phenomenon with an error less than one fifty thousandth of a second, and that with a very simple and cheap apparatus.

**A NEW ELECTRO-MEDICAL GALVANOSCOPE.**—*J. Morin.*—Consists of an ordinary two-branch electro-magnet, placed vertically, the breech being in the air. A magnetic needle is suspended by one of its poles over the breech, through which it penetrates by means of a large hole. The lower free pole of the needle descends as far as the level of the lower part of the electro-magnet's helices, between which it is able to oscillate. The needle is long enough to penetrate the breech to the height of its neutral point, thus nullifying at that spot all reciprocal action. On making a current circulate in the helices, the two poles act in the same direction upon the free pole of the magnetic needle, causing it to be displaced towards one of the helices, according to the direction of the current. The apparatus is said to answer the purpose for which it has been devised.

**ELECTRO-CAPILLARY ACTIONS, AND THE FORCES PRODUCING THEM.**—*M. Becquerel.*—A thin platinum plate, full of a large number of small holes is applied to each face of the permeable partition of an electro-capillary machine. These plates form the electrodes of the couples, inasmuch as they serve for conductors, being in contact with the damp sides of the partition. On the outer face of each of these plates wires of the same metal are fastened, and, including a very sensitive galvanometer, form a closed circuit. The magnetized needle is not deflected, a proof that all the electricity emitted under the reaction of the two liquids is transformed into an electro-capillary current without the intervention of a derived current—an effect contrary to that observed with voltaic currents traversing liquids. The conclusion to be deduced is that the electro-capillary current, resulting from the reaction of the two solutions upon one another, produces a chemical action equal to that reaction. Numerous experiments prove that the stronger the electro-motive force, the more marked will be the electro-capillary actions.

The *London Standard* reports that Mr. Scudamore will retire from the British Post Office and go to Turkey to organize a postal service there in accordance with the Berne Convention.

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**TELEGRAPH ENGINEER,**  
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**PATENT PENCIL HOLDER.**

This Holder is intended to save the last half or third of the pencil.

**DIRECTIONS:**

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price.  
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**The Telegraphers' Mutual Benefit Association.**

ESTABLISHED OCTOBER 22, 1867.

Its object is to Aid the Families of  
Deceased Members

BY PAYMENT TO THE HEIRS OF \$1,000.

Any person who is, or who has been, employed in telegraph service in any capacity, may become a member of this Association upon giving proof of good health and habits, and payment of the required fees.

**INITIATION FEE, \$2.00.**

Payments required: One Dollar upon the Death of each Member.

Application blanks, copies of the By-Laws, and other information furnished upon application to the Secretary, or any of the Agents.

The attention of former members of the Association is called to the following resolution, passed at the last Annual Meeting of the Association:

RESOLVED, That delinquent members shall be eligible to renewed membership on payment of back dues to an amount not EXCEEDING FIVE DOLLARS, and without further initiation fee.

W. HOLMES, Secretary. J. D. REID, Treasurer.  
Box 3175, New York.

N. B.—Members will please note change in number of Post Office Box.

Photographs and stereoscopic views of the operating room and switch of the New York Office have been taken and will be sold for the benefit of the Telegraphers' Mutual Benefit Association.

**REDUCED PRICES AS FOLLOWS:**

Operating Room, 10x14 inches.....\$1.25  
" 8x10 " ..... .75  
Switch, 8x10......75

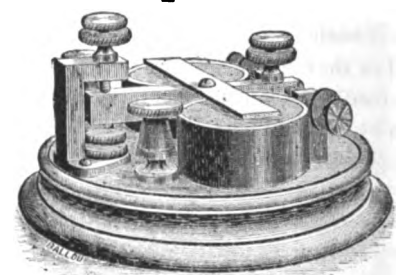
**STEREOSCOPIC VIEWS.**

Operating Room......35  
Switch......35

Address orders for any of the above to the Secretary of the Association.

**LITTLE MONITOR**

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PRICE, \$6.00.

THE FINEST SOUNDER MADE.

THOUSANDS IN USE.

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Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful little Sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. Price, \$4.00.

No cast or malleable iron used in these instruments.

Sounder and Key, together, \$9.00.

Orders filled promptly and sent on receipt of price, or C. O. D., if 10 per cent. accompanies the order.

**M. A. Buell & Sons,**  
86 Bank Street, Cleveland, O.



WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, July 2d, 1875.

This Company is now prepared to pay the principal and accrued interest of its Bonds, maturing November 1st, 1875, upon delivery of the Bonds at this office.

R. H. ROCHESTER, Treas.

**WANTED**—BY YOUNG MAN, A FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 140, Janesville, Wis.



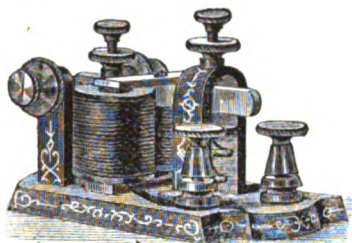
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ELECTROTYPE Cards of Key, Sounder and Relay, with your name printed in handsome type on 25 extra fine Bristol, white and tinted, for 25c., or 50, with business and address, for 50c. Samples, 3c. Railroad Operators send 10cents extra for conductor's and brakemen's electrotype cards. You can make money. Agents outfits, with the handsomest and most stylish cards printed, for 25c.

Address, F. P. MUNN,  
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## A Great Reduction in Prices.

I am now making a specialty of my PHIL. SHERIDAN SOUNDER AND KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



PHIL. SHERIDAN, \$4.00.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. Extra.



PHIL. SHERIDAN KEY, PRICE, \$2.00.

You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, etc., etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Callaud Battery, 1 lb. Blue Vitrol, Connection Wire, Book of Instruction, etc., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price. Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

A. B. LYMAN,  
91½ SENECA ST., Cleveland, Ohio.

## CALLAUD BATTERY,

KEPT ON HAND

AND

Orders filled by

W. MITCHELL McALLISTER,  
728 Chestnut Street, Philadelphia.

CHARLES WILLIAMS, Jr.,  
109 COURT ST., Boston, Mass.

AND BY

The Western Electric Manuf. Co.

Agents for the United States.

220 KINZIE ST., Chicago, Ill.

## LECLANCHE BATTERIES.



### IMPORTANT NOTICE.

After January 1st, 1875, we allow 20 cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

A list will be furnished on application to

The LECLANCHE Battery Co.,  
40 West 18th Street.

Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
No. 8 Dey Street.

PHILADELPHIA: 54 South Fourth Street.  
CINCINNATI: 22 West Fourth Street.

## The "Snapper" Sounder.



PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

PRICE 75 CENTS.

Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

## EUGENE F. PHILLIPS,

MANUFACTURER OF

REED & PHILLIPS' PATENT INSULATED  
TELEGRAPH WIRE,

PATENT RUBBER-COVERED WIRE,

PATENT ELECTRIC-CORDAGE, CABLES, etc., etc.

No. 20 CONDUIT STREET,

PROVIDENCE, R. I.



SENT ON RECEIPT OF PRICE.

26 & 28 Waring Block, Cleveland, O.

## AMERICAN LINE.

Weekly Mail Steamship service between  
PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from  
Philadelphia.

*KENILWORTH.....July 29	CITY OF LIMERICK.....Aug. 19
PENNSYLVANIA.....Aug. 5	OHIO.....Aug. 26
INDIANA.....Aug. 12	ILLINOIS.....Sept. 2

PRICES OF PASSAGE IN CURRENCY.

Cabin, \$100.

Steerage and intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate, Passenger accommodations for all classes unsurpassed.

For passage, rates of freight and other information apply to

GEO. W. COLTON, Agent, 42 Broad street, N. Y.

JOHN McDONALD, Passenger Agent, 8 Battery Place, N. Y.

PETER WRIGHT & SONS, General Agents,  
307 Walnut Street, Philadelphia.

Richardson, Spence & Co. | N. & J. Cummins & Bro.,  
Liverpool. | Queenstown.

## Red Star Line.

Appointed to carry the Belgian and United States Mail.

The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia. From New York.

NEDERLAND.....July 31	STATE OF NEVADA.....Aug. 13
VADERLAND.....Aug. 25	SWITZERLAND.....Sept. 6

FROM ANTWERP.

For Philadelphia. For New York.

VADERLAND.....Aug. 1	SWITZERLAND.....Aug. 13
NEDERLAND.....Aug. 25	STATE OF NEVADA.....Sept. 6

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - - - \$90. Second Cabin, - - - \$60

Steerage tickets to and from all points at the lowest rates.

Passenger accommodations for all classes unsurpassed.

For passage, rates of freight and other information apply to

GEO. W. COLTON, Agent, 42 Broad Street, N. Y.

JOHN McDONALD, Passenger Agent, 8 Battery Place, N. Y.

PETER WRIGHT & SONS, General Agents,  
307 Walnut Street, Philadelphia.

B. vonder Becke, General European Agent, Antwerp.

## WESTERN ELECTRIC MANUF'G CO.

SOLE AGENTS,

## Orton's Patent Awl Clip.

These Clips have been in practical use for three years, and are rapidly displacing all others,

They are designed for holding messages and every form of blanks.

For convenience, durability and economy they are unsurpassed.

## Western Electric Manuf'g Co.

220 KINZIE STREET, Chicago, Ill.

## ORTON'S

## Patent Security Message Hook.

The damage resulting from the loss of a single message is frequently sufficient to equip a line many times with this hook. Papers cannot be blown or carelessly crowded from it.

These Hooks were first introduced by Geo. H. Bliss & Co.

Thousands of them are in use in telegraph offices, banks and counting rooms.

PRICE 30 CENTS EACH, or \$3.00 PER DOZEN.

Liberal terms to the trade.

## WESTERN ELECTRIC MFG. CO.

20 KINZIE STREET, Chicago, Ill.



**AMERICAN FIRE ALARM.**

AND  
POLICE TELEGRAPH.

GAMEWELL & CO., PROPRIETORS.

NO. 62 BROADWAY, NEW YORK.

J. W. STOVER,  
General Agent and Superintendent.  
L. B. FIRMAN, Chicago, Ill.  
General Agent for the West and Northwest.  
J. R. DOWELL, Richmond, Va.,  
Special Agent for Virginia and North Carolina.  
J. A. Brenner, Augusta, Ga.,  
Special Agent for Georgia and South Carolina.  
L. M. MONROE, New Canaan, Conn.,  
Special Agent for New England.  
ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,  
San Francisco, Cal., Special Agents for California, Oregon  
and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

**AUTOMATIC PLAN,**

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM RELIABILITY :

Albany, N. Y.	New Orleans, La.
Alleghany, Pa.	New Haven, Conn.
Boston, Mass.	Newark, N. J.
Buffalo, N. Y.	Omaha, Nebraska.
Baltimore, Md.	Philadelphia, Pa.
Chicago, Ill.	Pittsburg, Pa.
Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass.	Quebec, L. I.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
Dayton, Ohio.	Indianapolis, Ind.
Elizabeth, N. J.	St. Louis, Mo.
Fall River, Mass.	St. John, N. B.
Fitchburg, Mass.	Springfield, Mass.
Hartford, Conn.	San Francisco, Cal.
Jersey City, N. J.	Savannah, Ga.
Louisville, Ky.	Syracuse, N. Y.
Lawrence, Mass.	Troy, N. Y.
Mobile, Ala.	Toledo, Ohio.
Montreal, Canada.	Toronto, Canada.
Milwaukee, Wis.	Washington, D. C.
New York City.	Worcester, Mass.
Lynn, Mass.	New Bedford, Mass.
Lowell, Mass.	Bridgeport, Conn.

The distinctive features of these systems of

**FIRE ALARM AND POLICE TELEGRAPHS**

ARE

*First*—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables anyone—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchmen.

*Third*—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

*Fourth*—The ELECTRO-MECHANICAL GONG STRIKER, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

*These features combined form the*

ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM

OF

FIRE ALARM TELEGRAPH IN THE WORLD.

Messrs. GAMEWELL & CO. are the owners of the original *FARMER AND CHANNING PATENTS*, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

MORE THAN TWENTY PATENTS,

The introduction and operation of the  
AUTOMATIC SYSTEM

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

*The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.*

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

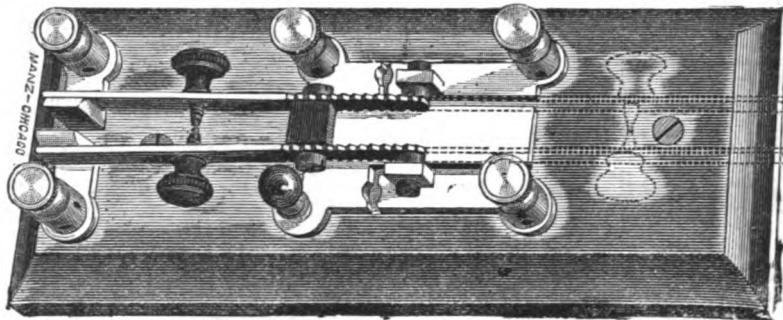
**THE WESTERN ELECTRIC MANUFACTURING CO.**

220 KINZIE STREET, CHICAGO, ILL.

WE KEEP IN STOCK THE FOLLOWING ARTICLES:

GALVANIZED WIRE,  
COMPOUND WIRE,  
SCREW GLASS INSULATORS,  
(Cauvet's Patent).  
BRACKETS, PINS, SPIKES,  
BROOKS' INSULATORS,  
PLIERS, VISES, PULLEYS, CLIMBERS,  
WINDOW TUBES, BATTERY BRUSHES,  
SYRINGES, FUNNELS, HYDROMETERS,  
ACIDS AND CHEMICALS FOR BATTERIES,

KERITE WIRE,  
BRAIDED AND WOUND OFFICE WIRE,  
GUTTA PERCHA OFFICE WIRE,  
SWITCH CORD,  
CALLAUD BATTERY,  
DANIELL BATTERY,  
GROVE BATTERY,  
BUNSEN BATTERY,  
LECLANCHE BATTERY,  
HILL BATTERY,



REGISTERS,  
RELAYS,  
BOX RELAYS,  
SOUNDING RELAYS,  
SOUNDERS,

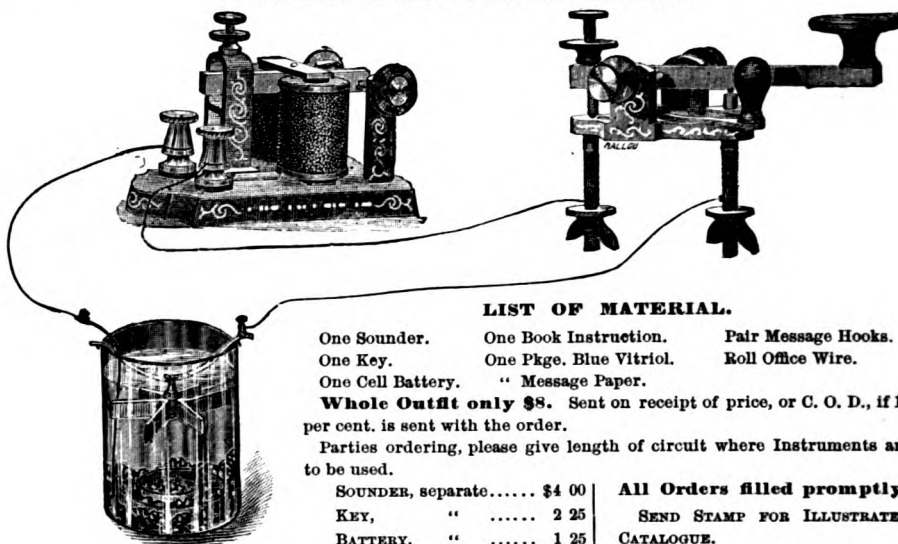
KEYS,  
MEDICAL INSTRUMENTS,  
HOTEL ANNUNCIATORS,  
PLUG CUT-OUTS,  
CUT-OUTS, (new style),

REPEATERS,  
SWITCHES,  
GALVANOMETERS,  
INDUCTION COILS,  
ALARM BELLS,

Our Morse Instruments are of the Western Union, Ottawa (or Caton) style.  
We have ample facilities for the execution of every variety of electrical work.

**THE EUREKA INSTRUMENT.**

A COMPLETE SET FOR OFFICE USE.

**LIST OF MATERIAL.**

One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
One Cell Battery.	" Message Paper.	

**Whole Outfit only \$8.** Sent on receipt of price, or C. O. D., if 10 per cent. is sent with the order.

Parties ordering, please give length of circuit where Instruments are to be used.

SOUNDER, separate.....	\$4 00
KEY, " .....	2 25
BATTERY, " .....	1 25

**All Orders filled promptly.**  
SEND STAMP FOR ILLUSTRATED  
CATALOGUE.

**M. A. BUELL & SONS, 86 Bank St., Cleveland, O.**

**NO OTHER MAIN LINE SOUNDER**  
has proven as PERFECT an INSTRUMENT as that made by us the past two years.

**NO RESISTANCE, EASY ADJUSTMENT AND  
HANDSOME APPEARANCE COMBINED.**

No other instrument offered for this purpose has the advantages secured to ours. See other columns of this paper.

**WATTS & COMPANY,**  
No. 47 Holiday Street,  
BALTIMORE, MD.

Send for Catalogue and Price List.

**SCREW GLASS INSULATORS  
AND BRACKETS,**

Of the size and thread used by the Western Union Telegraph Company.

Having secured an Exclusive Agency for the Insulators, (manufactured under the Cauvet patent,) we are filling orders promptly for large or small quantities, at prices as low as any Insulator can be sold for in the market.

**THE WESTERN ELECTRIC MFG. CO.,**

220 Kinzie Street,

CHICAGO, ILL.



**WATTS & COMPANY,**

No. 47 HOLIDAY STREET,

BALTIMORE, MD.

SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS,  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
SWITCHES, GALVANOMETERS,  
RESISTENCE COILS.

A COMPLETE STOCK OF EVERYTHING FOR THE TELE-  
GRAPH OFFICE OR CHEMICAL LABORATORY.

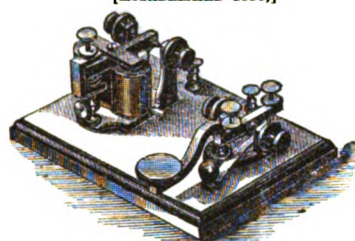
Special attention given to repairing Scientific instruments.  
Several of our workmen having served their time in the most  
prominent European manufactories, enables us to guarantee  
satisfaction.

SEND FOR CATALOGUE AND PRICE LIST.

**CHARLES WILLIAMS, Jr.,**

109 COURT STREET, BOSTON.

[ESTABLISHED 1856.]



\$11.50

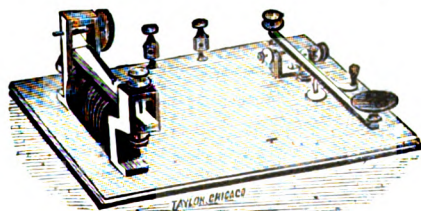
MANUFACTURER ON

Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

## THE AMATEUR Telegraph Apparatus

Comprises SOUNDER, KEY CUP OF BATTERY, CHEMI-  
CALS, WIRE AND MANUAL.

Several thousand of these instruments already sold,  
They give good satisfaction.

**PRICES:**

AMATEUR OUTFIT, COMPLETE, No. 1, - - -	\$7 50
" " " " No. 2, - - -	6 50
" SOUNDER AND KEY, No. 1, - - -	6 50
" " " " No. 2, - - -	5 50
" BATTERY, PER CELL, - - -	65

**DISCOUNTS.**

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

**GEO. H. BLISS & CO.,**

220 KINZIE STREET,

CHICAGO, ILL.

## BUNNELL'S NEW GIANT SOUNDERS PERFECTED.

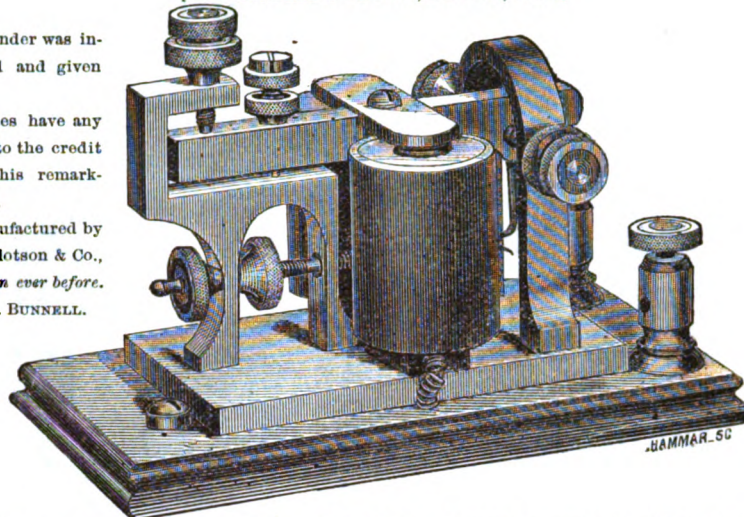
[J. H. BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was in-  
vented, patented and given  
its name by me.

No other parties have any  
claim whatever to the credit  
of originating this remark-  
able instrument.

It is being manufactured by  
Messrs. L. G. Tillotson & Co.,  
*more perfectly than ever before.*

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable  
and substantial shape.

They give enormous sound with but little Local Battery power.  
Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder  
is desired.

**PRICE, \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

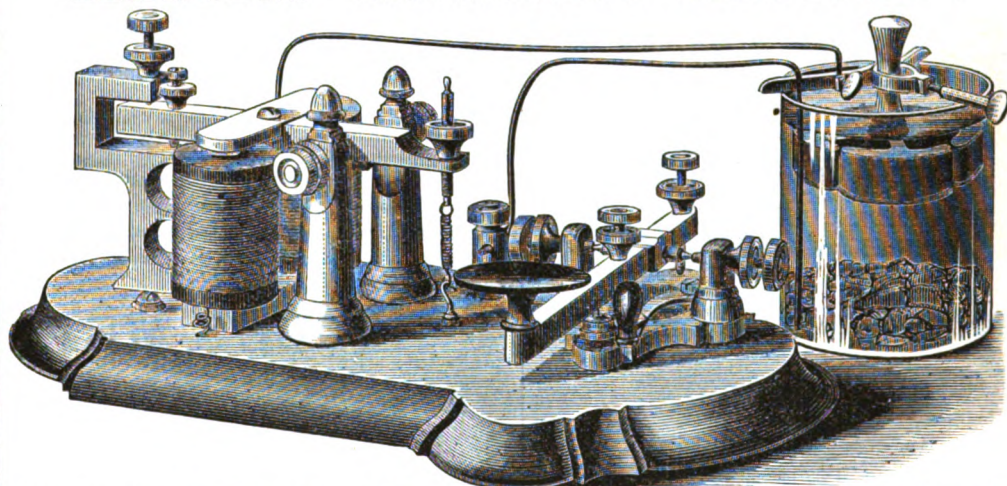
**L. G. TILLOTSON & CO.,**

8 Dey Street, New York,

54 South 4th Street, Philadelphia,

DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

## BUNNELL'S LEARNERS' INSTRUMENT PERFECTED!



**Complete and Perfect, full-sized Sounder and Key complete, with  
Book of Instruction, Battery, Wire and all necessary Materials.**

[These instruments have been greatly improved in their working qualities and in the style in which they are finished.  
Those having the latest improvement in their construction are those manufactured *only* by Messrs. L. G. TILLOTSON & Co.  
JESSE H. BUNNELL.]

**These Sets are made in the best manner, and are just exactly the thing wanted  
FOR LEARNERS' USES,**

**FOR TELEGRAPH SCHOOLS,****Or FOR SHORT LINES, from a few feet to 12 miles long.**

**Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials**  
to put in operation, singly or on a short line . . . . . \$8 50  
**Learners' Instrument, without Battery, &c.,** . . . . . 6 50  
**Ornamental Learners' Instrument, Rubber Covered Coils, &c.,** . . . . . 7 50  
Same instruments, wound with finer silk-covered wires, so as to operate satisfactorily lines  
up to twelve miles in length, \$1.00 in addition to above prices.

A copy of Smith's Manual, new and enlarged edition (See advertisement in another column) sent with each complete  
outfit of BUNNELL'S PERFECTED LEARNERS' INSTRUMENT.

These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order  
or Draft.

**L. G. TILLOTSON & CO.,**

8 Dey Street, New York, 54 South 4th Street, Philadelphia, and 22 West 4th Street, Cincinnati,

**DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.**



## A SUPERIOR PRINTING TELEGRAPH INSTRUMENT, For Private and Short Lines.

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. H. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is SIMPLE, RELIABLE, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

### PRIVATE LINES

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employes, &c., for the introduction of the Printer.

For further particulars, terms, &c., apply to

**Merchants' Manufacturing and Construction Co.,**

S. J. BURRELL, SUPERINTENDENT,

No. 50 BROAD STREET, Rooms, 12, 13, 14.  
P. O. Box 496.

## JOSEPH MOORE & SONS,

ESTABLISHED 1820,

535 & 537 CHINA STREET,

Below GREEN STREET, PHILADELPHIA, PA.

## Insulated Wire Manufacturers.

INSTRUMENT AND OFFICE WIRES,

FLEXIBLE CORDS, CABLES,

HEAVY INSULATED LINE WIRE,

RESISTANCE WIRE.

WIRES OF EVERY VARIETY OF INSULATION.

## GEO. H. BLISS & CO.,

220 Kinzie St., CHICAGO, ILL.

TELEGRAPH INSTRUMENTS AND SUPPLIES in great variety, of the latest patterns and highest finish.

Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on Instruments of our manufacture, when remittance accompanies order.

GEO. H. BLISS & CO.

## COPPER OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND,

SINGLE AND DOUBLE, WITH COTTON, LINEN, SILK;

PARAFFINED OR VARNISHED, COMPRESSED  
AND POLISHED.

Manufactured and for sale by

**WESTERN ELECTRIC MANUFACTURING CO.,**  
Chicago.

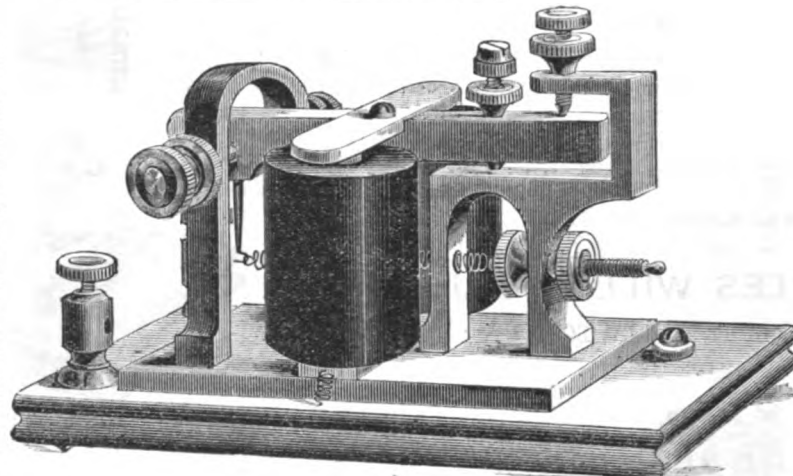
## PARTRICK & CARTER,

THE ONLY MANUFACTURERS OF THE ORIGINAL

## GIANT SOUNDER, PERFECTED,

Patented February 16, 1875.

BEWARE OF WORTHLESS IMITATIONS.



OFFICE AND MAGNET WIRE,  
BRAIDED AND WOUND, SINGLE AND DOUBLE,

with COTTON, LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.

MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every instrument warranted perfect.

**PRICE, sent C.O.D., \$7.50,**

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

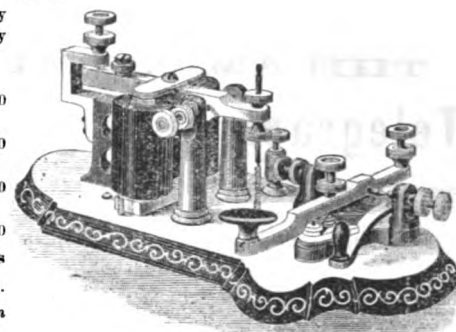
Price of single instrument, good for one mile or less, without Battery, &c. \$6.50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7.50

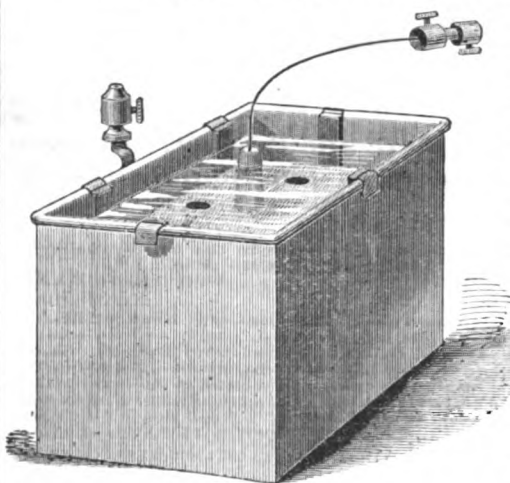
Price of single instrument, good for one to twelve miles, without Battery, &c. 7.50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8.50

This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.



## EAGLE'S METALLIC BATTERY.



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Calland, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

For OPEN CIRCUITS, where all other gravity batteries are ACKNOWLEDGED FAILURES, the Eagle's Battery is found to be in every respect a PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - - - \$2.25  
No. 2, Round " " - - - 2.00

PARTRICK & CARTER, Sole Agents,

38 South 4th Street, PHILADELPHIA, Pa.



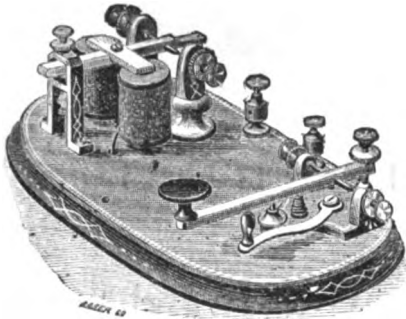
# Western Electric Mfg. Co., CO-OPERATIVE MFG. CO., 218 Pear St., Philadelphia.

220 KINZIE STREET, Chicago, Ill.

**Celebrated**

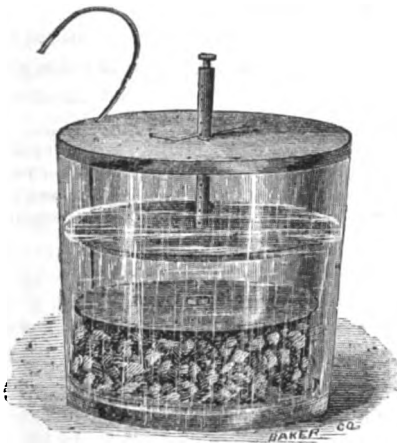
## PRIVATE LINE OUTFIT,

THE BEST IN THE MARKET.



## PRIVATE LINE INSTRUMENT.

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on a line from a few feet to ten miles in length.



## BLISS' RESERVOIR BATTERY.

This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

With each "Private Line Outfit" is furnished one Private Line Instrument, one cup of Bliss' Reservoir Battery, the necessary Chemicals, Wire for connections, and a Manual.

### PRICES:

PRIVATE LINE OUTFIT, complete, - - - \$10 00  
INSTRUMENT ONLY, - - - 8 00  
BLISS' RESERVOIR BATTERY, per cell, - - - 2 00

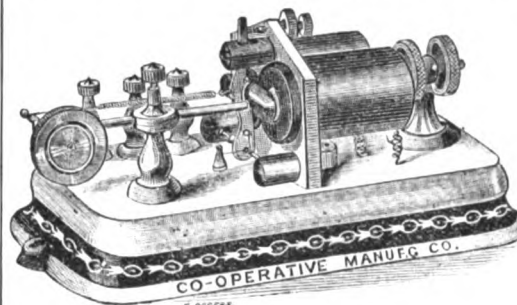
### DISCOUNTS:

A discount of twenty per cent. will be allowed when remittance is made in advance. Remit by express, registered letter, postal order, or draft.

In ordering, state length of line so that the resistance of instruments may be proportioned accordingly.

Send for Circular. Liberal terms to Agents,

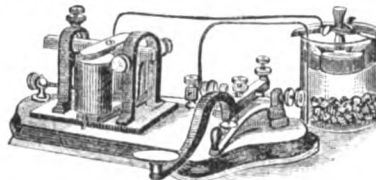
**WESTERN ELECTRIC MFG. CO.,**  
Chicago, Ill.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use.  
Is finely finished.

Price, - - - \$16.



Co-operators' Learners' Instrument No. 1.

A complete outfit embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practising or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined.

The above instrument is nicely finished in brass, and not like other manufacturers' that are made of cast iron.

Price of No. 1 Instrument when money is sent

In advance,	\$8 00
With Battery,	9 50
When sent C. O. D.,	8 50
With Battery,	10 00

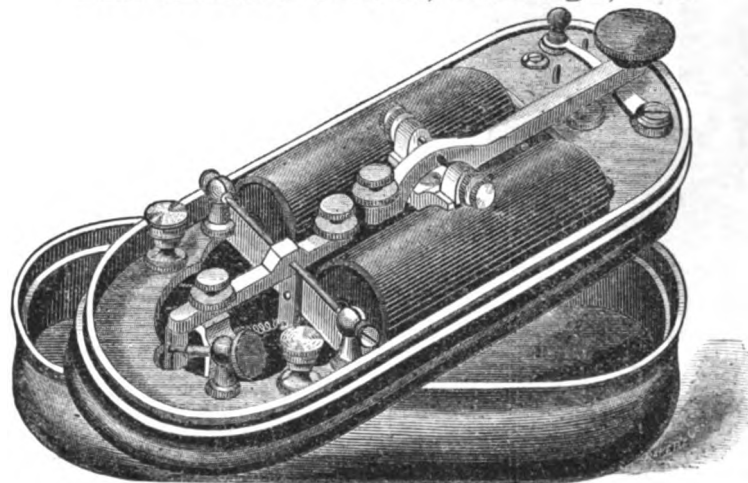
N. B.—Either of the above Instruments can be made to work on a circuit from one to twelve miles by Winding Magnets with fine wire which will make cost of Instrument one dollar extra.

Send for Price List.

**W. R. BALDWIN, Manager, 218 Pear Street, Philadelphia.**

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## POCKET RELAY,

PATENTED APRIL 13th, 1875.

Our Patent Pocket Relay has an improved key, large enough to be durable and for practical work. It has an independent circuit closer.

The sounding lever is supported by adjustable trunnion screws, and can be readily removed at any time, or adjusted as finely as a relay armature.

The adjustment spring is conveniently arranged, and can be repaired with ease.

The instrument gives a splendid sound.

The case is hard rubber and the same in length and width as the Caton Pocket Relay Case, and a trifle deeper.

It is pronounced the best finished and most serviceable Pocket Instrument made.

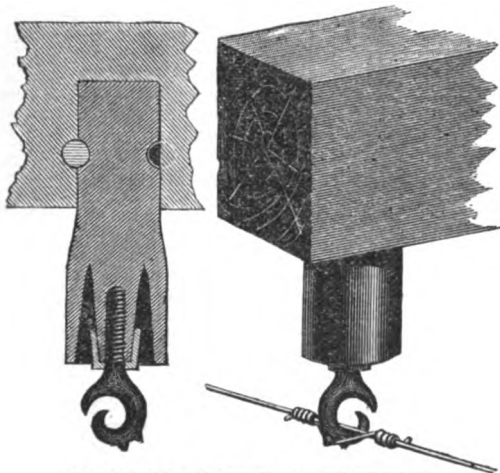
**PRICE, \$18.00.**

Twenty per cent. discount when money is sent with order.

**WESTERN ELECTRIC MANUFACTURING COMPANY.**

## THE KENOSHA INSULATOR CO.

Telegraph Companies and Telegraph Constructors are invited to examine the merits of our new and improved patterns of



### KENOSHA CARBON INSULATORS!

These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellent of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of SIX YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its *insulating qualities* are, on an average, MORE THAN TEN TIMES AS GREAT during the prevalence of rain or fog.

Immense numbers of these Insulators are in use by

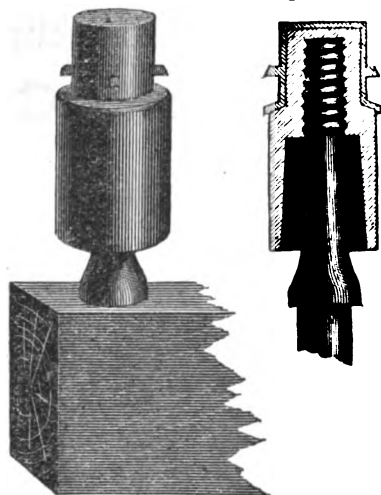
The North Western Telegraph Co.,

The Western Union Telegraph Co.,

as well as many RAILWAY and OTHER TELEGRAPH LINES, and they have invariably been found to give

### ENTIRE SATISFACTION.

Besides the Suspension Insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



**CAP INSULATOR, WITH PIN OR BRACKET,** which is fitted with a zinc protection, as shown in the above figure,

### THE KENOSHA INSULATOR

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice,

CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators,

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all Insulators furnished by us to prove entirely satisfactory.

THE KENOSHA INSULATOR CO.,

KENOSHA, WIS.

L. G. TILLOTSON & CO.,

8 Dey St., New York,

GENERAL EASTERN AGENTS.

THE WESTERN ELECTRIC MFG. CO., of Chicago,

GENERAL WESTERN AGENTS.

## JUST OUT! NEW AND ENLARGED EDITION.

OF

SMITH'S

## MANUAL OF TELEGRAPHY,

CONTAINING

COMPLETE DIRECTIONS FOR SELF-INSTRUCTION IN TELEGRAPHY,

INSTRUCTIONS FOR BUILDING AND OPERATING  
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together with full explanation of everything necessary for the  
Amateur Telegrapher to know.

Every operator and every learner of Telegraphy should have  
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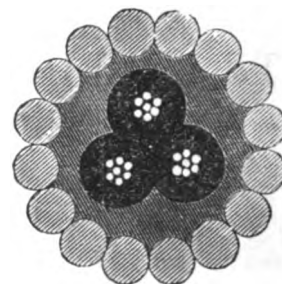
8 Dey Street, NEW YORK.

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S. BISHOP, Prop'r.

ONLY AMERICAN MANUFACTURER

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Pure Gutta Percha Goods,

IN THE

UNITED STATES.

Have on hand and made to order

SUBMARINE TELEGRAPH CABLES,

INSULATED WIRES, for

TELEGRAPH AND ELECTRIC USE, and for

BLASTING AND MINING PURPOSES,

in every variety desired.

As an Insulation for Telegraph Cables and Electric Conductors GUTTA PERCHA has been universally adopted by all scientific and practical Electricians and Manufacturers of Telegraph Cables and Wires in this country and Europe, and has sustained, with increasing confidence in the superiority, the practical test of over twenty years' general use.

The Proprietor would say to all parties desiring

SUBMARINE TELEGRAPH CABLES,

that he will guarantee to make and deliver at his Factory any style of Cable, Insulated with Gutta Percha, as low as they can import Cable of the same style and quality.

ORDERS RECEIVED AT THE FACTORY.

Messrs. L. G. TILLOTSON & CO.

8 Dey Street, New York,

25 South 4th Street, Philadelphia,

22 West 4th Street, Cincinnati,

have been appointed by me GENERAL AGENTS for the sale of any Telegraph Cable or Wire manufactured at the Works in New York, at Factory Prices, delivered, in New York.

JOHN THORNLEY, 503 Chestnut St., Philadelphia,

has been appointed Agent for the sale of any and all goods manufactured by me, at Factory Prices, delivered in New York

Any goods of my manufacture (except Telegraph Goods), are for sale in New York, by

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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 16.

NEW YORK, AUGUST 16, 1875.

WHOLE NO. 187.

## MATHEMATICAL DETERMINATION OF THE DERIVATIVE POINTS IN TELEGRAPHIC CABLES.

BY FREDERICK SCHAAK,

Secretary of the Direction of the German Imperial Telegraphs.

It is well known that the most laborious investigations have hitherto failed to supply a method of locating with precision, the defective points at which derivations or leakages of the galvanic current to the earth occur, in cases where there are more than one of these derivations in a telegraphic line or cable. If, however, there is, besides the defective wire, still another perfect one, the faults may be exactly determined by means of two measurements from the two stations which limit the defective section.

The importance of this solution, both in regard to accuracy of measurement and the rapid restoration of long telegraphic line and cables, and the saving in expense which will result therefrom, will be readily understood.

Between the stations A and B, fig. 1, extend the perfect wire  $l$  and the defective wire  $amb$ ;  $p$  and  $q$  are the derivations or leaks by which a portion of the electric current passes to the earth. If we call the resistance which the earth opposes to the current between  $p$  and  $q$  to zero, the letters  $a$ ,  $m$  and  $b$  to represent the value of the resistance of the three sections of the defective wire, then  $a + m + b = l$ , the resistance of the wire when in good order. The manner of arranging the connections is represented by fig. 2, in which  $R$  is the rheostat,  $B$  the battery, and  $G$  the differential galvanometer. At the station B both wires are connected together.

Owing to the fact that there are two paths for the current between the section  $a$  and the section  $b$ ; part of the current going through  $m$ , and part through  $p$ ,  $q$ , the apparent conductivity resistance of the faulty wire will be less than its real resistance. Let  $\alpha$  represent this apparent resistance; then, according to Ohm's law:

$$(1) \quad a + \frac{m(p+q)}{m+p+q} + b = \alpha$$

The resistance  $p+q$ , connected by the earth, may be considered a metallic conductor, the extremities of which are metallically connected with the extremities of  $m$ . According to Ohm's law the resistance

$\frac{m(p+q)}{m+p+q}$  is less than that of  $m$ , and consequently  $\alpha$  is likewise smaller than  $l$ . Let us denote this difference by  $r$ , thus:

$$(2) \quad l - \alpha = r$$

so that

$$(3) \quad r + a + \frac{m(p+q)}{m+p+q} + b = l$$

If we interpose the resistance  $r$  between one side of the angle  $z$  of the differential galvanometer and  $a$ , as in fig. 3, the rheostat will now in addition to the known resistances, give the resistance  $l$ .

By the interposition of the resistance  $r$ , between  $G$  and  $a$ , we have made the resistance:

$$r + a + \frac{m(p+q)}{m+p+q} = a + m$$

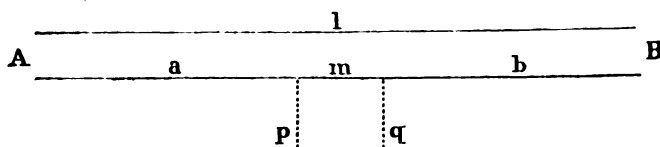


Figure 1.

If we now interrupt the connection between  $G$  and  $r$ , thus disconnecting  $a$ , and instead thereof connect the resistance  $w$  to the earth at  $z$  and adjust it in such a manner that the rheostat gives the resistance  $l$  as in the equation (3), then the entire system of connections has the value  $w + \frac{q(m+p)}{q+m+p} + b$

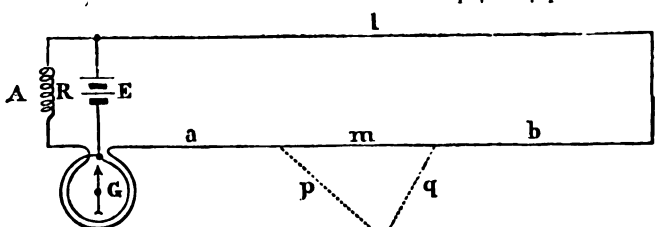


Figure 2.

and we consequently obtain:

$$(4) \quad w + \frac{q(m+p)}{q+m+p} + b = l$$

From the equation 3 and 4 we get:

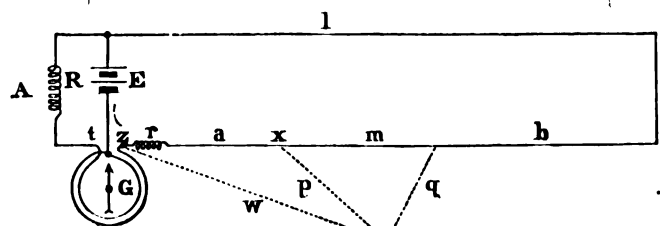


Figure 3.

$$(5) \quad w + \frac{q(m+p)}{q+m+p} = r + a + \frac{m(p+q)}{m+p+q}$$

If we now again connect  $r$  with  $z$ , equal portions of the current will enter into the two equal branches, and the reduced resistance of the two branches, in accordance with Ohm's law, is less than that of each

branch taken separately. Since, by the insertion of  $r$ , the system  $a + \frac{m(p+q)}{m+p+q}$  has become  $a + m$ ,

we may therefore denote by  $a + m$  the resistance of each branch. The reduced value produced on the rheostat  $\alpha$ , therefore, is:

$$(6) \quad \frac{(a+m)(a+m)}{2(a+m)} + b = \beta$$

$$\text{or:} \quad \frac{a+m}{2} + b = \beta$$

$$\text{but} \quad a + m + b = l$$

$$\text{consequently} \quad \frac{a+m}{2} = l - \beta$$

$$\text{therefore} \quad a + m = 2(l - \beta)$$

$$\text{and from that we have a result} \quad b = l - 2(l - \beta)$$

The same measurements from station B produce, if  $\frac{b+m}{2} = V$ :

$$(7) \quad a = l - 2(l - V)$$

Thus the two points of derivation,  $x$  and  $y$ , may be exactly determined from the stations A and B. If there be between these points several other derivations, it will make no difference whatever in the results, for  $m$  merely becomes less and  $r$  greater. But in this case, after having determined  $x$  and  $y$ , the manipulation must be repeated, in order to determine the other defective points. Whether there are still other derivations in existence may easily be ascertained after having found the values of  $a$  and  $b$ .

According to equation 1.

$$a - (a+b) = \frac{m(p+q)}{m+p+q}$$

$$\text{Since} \quad l - (a+b) = m$$

$$\text{and} \quad m = r + \frac{m(p+q)}{m+p+q}$$

this at once proves whether the latter equation is consistent. If  $m$  be greater than the sum of the resistances on the other side, then, between  $p$  and  $q$  there are still other derivations which may sometimes be determined either from the defective points already located, or from the stations after the removal of these faults.

By applying the law of Kirchhoff to this case, we obtain a statement of all our hypotheses. This law is as follows:

If a system of wires, connected together in an arbitrary way, be traversed by a galvanic current, then—

(1) The sum of the strengths of the current in all those wires which meet in one point is  $= 0$ ; and,



(2) In a system of wires which form an enclosed figure, the sum of the products of the intensity of the current, and the resistance in each branch, is equal to the sum of all the electromotive forces in the same circuit.

Suppose the galvanic current passes in the direction of the arrows and the existing currents in  $a$  and  $w$  are alike, as in fig. 4, then the same quantity of electricity flowing in  $a$  and  $w$  must flow from the points  $x$  and  $y$ . From these facts it follows respecting the direction  $a$  the current  $S - (s + s') = 0$

" " " " "  $S - (i + i') = 0$

" " " " "  $i' - i = 0$  and  $s' + s = 0$

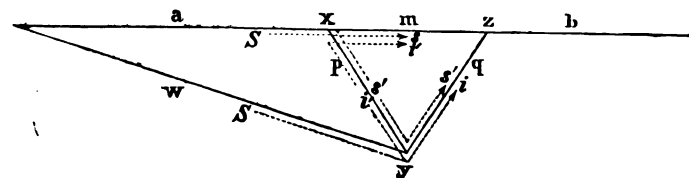


Figure 4.

As there is no electromotive force existing in the enclosed figure  $a w p$  and  $m p q$ , the products of the forces of the current and the resistances  $= 0$  in both figures, consequently in the figure  $a w p$

$$a S + p(s' - i') = w S$$

and in the figure  $m p q$

$$m(s + i') - p(s' - i') = q(s' + i)$$

From this we have by addition :

$$a S + m(s + i') = w S + q(s' + i)$$

and consequently, uniformity of the direction of the current.

#### ELECTRICAL STORM.

A correspondent writing from the peak on the extreme north line of the Uncompangre Mountains, in southwestern Colorado, tells the following thrilling story in the *Inter-Ocean* :

We had scarcely got started to work when we began to feel a peculiar tickling sensation along the roots of our hair, just at the edge of our hats, caused by the electricity in the air. At first this sensation was only perceptible and not troublesome. Still its strength surprised us, since the cloud causing it was yet several miles distant to the southwest of us. In the early part of the storm the tension of the electricity increased quite slowly, as indicated by the effect on our hair. By holding up our hands above our heads a tickling sound was produced, which was still louder if we held a hammer or other instrument in our hand.

The tickling sensation above mentioned increased quite regularly at first, and presently was accompanied by a peculiar sound almost exactly like that produced by the frying of bacon. This latter phenomenon, when continued for any length of time, becomes highly monotonous and disagreeable. Although the clouds were yet distant, we saw that they were fast spreading and already veiled many degrees of the horizon.

As the clouds approached nearer, the tension of the electricity increased more rapidly, and the extent of our horizon obscured by them increased in nearly the same ratio, so that the rapid increase in the electric tension marked also an increased velocity in recording angles and making sketches. We felt that we could not stop, though the frying of our hair became louder and more disagreeable, for certain parts of the drainage of this region could not be seen from any other peak, and we did not want to ascend this one a second time.

As the force of the electricity increased more and more and the rate of increase became greater and greater, the instrument on the tripod began to click like the telegraph machine when it is made to work

fast ; at the same time we noticed that the pencils in our fingers made a similar but finer sound whenever we let them lie back so as to touch the flesh of the hand between the thumb and the forefinger. This sound is at first nothing but a continuous series of clicks, distinctly separable one from the other, but the intervals becoming less and less, till finally a musical sound results.

The effect on our hair became more and more marked, till ten or fifteen minutes after the first appearance there was sudden and instantaneous relief, as if all the electricity had been suddenly drawn from us. After the lapse of a few seconds the cause became apparent, as a peal of thunder reached our ears. The lightning had struck a neighboring peak and the electricity in the air had been discharged. Almost before the sound reached us the tickling and frying in our hair began again and the same

series of phenomena were again repeated, but in quicker succession, the sounds becoming louder at the same time.

The clouds now began to settle into the Great Canon of the Lake Fork and boiled about in a curious manner. Here and there a patch of cloud would separate from the main mass and move about by itself. In passing over a thick cluster of pines down near the bed of the canon the lower parts would get caught and drag through with the greatest difficulty. The different parts seemed to be affected by different currents in the air and at times two little masses of cloud would pass each other less than a mile apart, but would soon turn aside, or rise up, or lose themselves in the great cloud that pretty nearly filled the Great Canon and its branches. At times a portion of the mass, moved by an upper current, would rise several hundred feet above the general level, and the force ceasing, would topple over and slowly fall back and lose itself in the general mass. The whole moved about in a chaotic manner, producing a curious effect.

When you consider that the top of the cloud was not less than 2,000 feet below us, you can form some idea of the strange scene that presented itself to our eyes in those exciting times. The clouds soon began to rise up and approach us. As they did so the electricity became stronger and stronger, till another stroke of lightning afforded instantaneous relief; but now the relief was only for an instant, and the tension increased faster and faster till the next stroke. By this time the work was getting exciting. We were electrified, and our notes were taken and recorded with lightning speed, in keeping with the terrible tension of the storm-cloud's electricity.

The cloud reached us, coming on like a fog, looking thin and light near us, but densely white at a short distance. All the phenomena before mentioned increased in force after each succeeding stroke of lightning, while the intervals between strokes became less and less. When we raised our hats our hair stood on end, the sharp points of hundreds of stones omitted a continuous sound, while the instrument out-sang everything else, and even in this high elevation could be heard distinctly at the distance of fifty yards. The points of the angular stones being at different degrees of sharpness, each produced a sound peculiar to itself.

The general effect of all was as if a heavy breeze were blowing across the mountains. The air was quite still, so that the wind could have played no part in the strange natural concert, nor was the intervention of a mythological Orpheus necessary to give to these trachytic stones a voice. Having completed a rough sketch of as much of the surround-

ing country as was not obscured by clouds, I hastily took up the mercurial barometer, hoping to get a reading before we should be compelled to leave the summit ; but alas ! too late for success.

The lightning strokes were now coming thicker and faster, being separated by not more than two or three minutes of time, and we knew that our peak would soon be struck. As I took the barometer out of its leathern case, and held it vertically, a terrible humming commenced from the brass ring at the end, and increased in loudness so rapidly that I considered it best to crawl hastily down the side of a peak to a point a few feet below the top where, by lying low between the rocks, I could return the instrument to its case with comparative safety.

At the same time Wilson was driven from his instrument, and we both crouched down among the rocks to await the relief to be given by the next stroke, which, for aught we know, might strike the instrument which now stood alone on the summit. At this time it was producing a terrible humming, which, with the noises emitted by the thousands of angular blocks of stone, and the sounds produced by our hair, made such a din that we could scarcely think. The fast-increasing electricity was suddenly discharged, as we had anticipated, by another stroke of lightning, which, luckily for us, struck a point some distance away.

The instant he felt the relief Wilson made a sudden dash for the instrument, on his hands and knees, seized the legs of the tripod, and flinging the instrument over his shoulder, dashed back. Although all this occupied only a few seconds the tension was so great that he received a strong electric shock, accompanied by a pain as if a sharp-pointed instrument had pierced his shoulder where the tripod came in contact with it.

In his haste he dropped the small brass cap which protected the object glass of the telescope ; but as the excitement and danger had now grown so great he did not trouble himself to go back after it, and it still remains there in place of the monument we could not build to testify to the strange experiences on this our station twelve. We started as fast as we could walk over the loose rock down the southeast side of the peak, but had scarcely got more than thirty feet from the top when it was struck. We had only just missed it, and felt thankful for our narrow escape.

#### NEW ELECTRO-MAGNETIC CLOCK.

Messrs. T. Cooke and Sons, of York, England, have completed the erection of an electric motor and clock dial in the telegraph gallery of the new buildings of the General Post Office, London, which in some points, is novel and interesting. The hands of the large dial, which are driven by the motor, are at a distance of about forty-five feet from it, and are connected to it by means of iron rods and several pair of bevel wheels for turning the bends. The dial itself is six feet in diameter, and such is the sensitiveness and power of the motor that the connecting rods, bevel wheel work, and bands, are driven by a single Lelanche cell of small size, the current from which is transmitted by the standard clock in the gallery. The motor consists simply of a polarized pendulum vibrating between two pairs of electro magnets, carrying a double ratchet at the upper end, the pointer of which is worked by a vane at the top of the buildings.

Our life is determined for us; and it makes the mind very free when we give up wishing, and only think of bearing what is put upon us, and doing what is given us to do.

## POST OFFICE TELEGRAPHS.

AN ACCOUNT showing the GROSS AMOUNT received during the Year ended 31st December, 1874, the Amount of EXPENSES incurred during the Year, and the BALANCE remaining applicable to pay the ANNUITIES or INTEREST falling due upon the SECURITIES issued under the Authority of the "TELEGRAPH ACT, 1869," and as a Sinking Fund for the Redemption of such Securities.—(Pursuant to Act 32 & 33 Vict. c. 73, s. 20.)

	£.	s.	d.		£.	s.	d.
Gross Amount received from the Post Office from the 1st January, 1874, to the 31st December, 1874, in respect of Telegraphic Messages, Private Wire Rentals, Special Wires, etc. - - - -	1,601,662	17	10	Amount expended by the Post Office from the 1st January, 1874, to 31st December, 1874, in respect of Salaries, Rent, Maintenance of Telegraphs, etc. - - - -	1,051,376	12	2½
Less—Amount paid to Submarine Telegraph Companies, being Message Receipts collected on their behalf, and amount allowed to Postmasters in respect of sums paid by them for the special delivery of Messages, etc.,	441,124	17	9	Balance remaining applicable to pay the Annuities or Interest falling due upon the Securities issued under the authority of the Telegraph Act, 1869, and as a Sinking Fund for the redemption of such Securities, on the 31st December, 1874. - - - - -	109,161	7	10½
£	1,160,538	—	1	£	1,160,538	—	1

Notes.—1. This Account, like the previous Accounts, is based upon the actual receipts and the actual payments of the Post Office, but as Telegraph expenditures by the Office of Works was, from 1st April, 1874, borne by the Vote for that Department, the sum so paid from 1st April to 31st December, 1874, viz: 20,578*l.*, is not included in this Account.

2. During the year 1874 a proportion of the costs for providing sites for certain Post Offices was chargeable to the Telegraph service; but as the precise proportion so chargeable has not yet been ascertained in each case, the amount has not been included in this Account. The amount is estimated at about 10,750*l.* No provision was made in the Telegraph Vote for these charges until after the close of the year 1874.

3. In this Account is included superannuation allowances to non-effective Telegraph officers for one year and three-quarters, of which about 17,800*l.* is proper to the previous year.

General Post Office,  
17 June, 1875.

GEO. RICHARDSON,  
Principal Book-keeper.

GEO. CHETWYND,  
Receiver and Accountant General.

### STATEMENT of the APPLICATION of the BALANCE of TELEGRAPH REVENUE in the Year to 31st December, 1874, as shown in the above Account.

Amount of balance remaining applicable to pay the Annuities or Interest, as above shown - - - -	£.	s.	d.
	109,161	7	10
Amount of Interest on the capital stock (Consols) created in receipt of Money raised for the purchase of Telegraphs, etc., viz:	£.	s.	d.
Under 32 & 33 Vict. c. 73 - - - - -	7,588,757	—	—
Under 34 & 35 Vict. c. 75 - - - - -	1,079,043	—	—
Under 36 & 37 Vict. c. 83 - - - - -	1,190,000	—	—
	9,857,800	—	—
Less—Stock purchased and cancelled on account of Surplus Balance:			
Period to 31 December, 1870	£.	s.	d.
Year to 31 December, 1871	54,771	17	8
	12,830	3	3
	67,602	—	11
Capital Stock - - - - -	£ 9,790,197	19	1
<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <div style="display: flex; align-items: center;"> <div style="font-size: 3em; margin-right: 10px;">{</div> <div>Interest for One Year to 5 January, 1875.</div> </div> <div style="text-align: right;">293,705 18 9</div> </div> </div>			
Add—Deficiency of balance Revenue up to 31 December, 1873, for payment of Interest on Stock created— <i>Vide</i> Parliamentary Paper, No. 266, Session 1874 - - - -			
	288,607	12	5
	582,313	11	2
Deficiency of Telegraph Revenue up to 31st December, 1874, to meet Interest on Telegraph Stock created - - - -	£.		
	473,152	3	4

## THE LATE GEORGE HART MUMFORD.

On the afternoon of Tuesday, August 10th, a numerously attended meeting of the friends and associates of the late George H. Mumford, Vice-President and Secretary of the Western Union Telegraph Company, was held in the office lately occupied by him in the Western Union Building, to take action in regard to his death. Nearly all of the leading telegraphers in New York were present and a number of addresses were made all eloquent in their acknowledgment of the high attributes and character of the deceased. Hon. William Orton was chosen chairman, and Mr. George B. Prescott, secretary of the meeting. On taking the chair, Mr. Orton spoke as follows :

"As the meeting which I knew was called for to-day, was to take place earlier this morning than I could be at the office, I gave the subject which has called us together no special thought in reference to presenting anything to the meeting. And yet it requires no special preparation to enable me to say for myself, and I think also for all here assembled, that the occasion which has called us together is not that of a common loss. With each of us it is but a question of time when our summons shall come and in respect to each of us there will be a circle wider or narrower of sorrowing friends. But in respect to the friend who has gone, outside of the family circle and of friends and relatives, outside of the circle around me, all of whom have sustained business relations with him there is a very large constituency of thinking, intelligent men whose business intercourse with him had taught them to appreciate his qualities and become warmly attached to him for his many private virtues.

"I have had occasion many times in my life both in business and in social circles to mourn the loss of near and dear friends. Excepting only in the case of my brothers I have had no loss that came nearer to my heart than this. Mr. Mumford had been to me all that a son could be, all that a brother could be, all that any friend could be, in addition to being in his official position, a most faithful, attentive and devoted assistant.

"It is, therefore, especially gratifying to me that this meeting has been convened to make some fitting expression of the common sorrow we feel on the occasion of our common loss."

Hon. A. B. Cornell, in offering a series of resolutions, made the following remarks :

"MR. CHAIRMAN—I was very much surprised on receiving an invitation to attend this meeting, to receive also a request from the gentlemen who called the meeting that I would prepare some resolutions for consideration at this time. I felt at the time that a more unfortunate selection could not have been made. Under any ordinary circumstances I should have requested to be relieved, but as the object of the meeting was to take action in reference to the death of Mr. Mumford, I felt that I could not ask to be excused from any duty that was laid upon me. I have, therefore, prepared for the purpose some resolutions which I will read:

*Whereas*, It has pleased our Heavenly Father, in His infinite wisdom, to remove from this life, suddenly, in a foreign land, our late cherished colleague, George Hart Mumford, one of the Vice-Presidents of the Western Union Telegraph Company, who, by his manly qualities, had won the sincere respect and affectionate regard of his official associates; and, whereas, we, who have for many years been connected with him in the management of a great business, desire to express our feeling of sorrow, and record a tribute of respect to his memory, it is

*Resolved*, That by Mr. Mumford's death our company has lost an officer of inestimable value; one whose superb intelligence, improved by a careful and thorough education, and an enthusiastic devotion to the business in all of its varied details, and supplemented by an unimpeachable integrity, genial courtesy, and rare dignity of character fitted him to discharge all official duties with wisdom and discretion remarkable for one of his age. In him the community has lost a citizen of the highest character, devoted to the best interests of society, loyal to his country in her darkest hour, and respected by all good citizens; one whose brilliant career, which had not yet reached its meridian, gave promise of the greatest future usefulness and influence.

*Resolved*, That, by his early death, in the prime of vigorous manhood, his family has lost an affectionate and devoted husband and father, who was the pride and glory of a happy home; and we tender our warmest sympathy and condolence to the stricken wife and tender children, whom we commend to the care of Him who is the refuge and shield of the widow and orphan. We also tender our respectful sympathy to the widowed mother and affectionate sisters, to whom he was a dutiful son and a loving brother.

*Resolved*, That as a tribute of respect a committee consisting of Norvin Green, John Van Horne, Anson Stager, John C. Hinchman, A. S. Brown, W. J. Holmes, S. B. Gifford, John B. Van Every, James D. Reid and A. H. Watson, is hereby designated to receive the remains on arrival in New York, escort them to Rochester, attend the funeral, and, if agreeable to the family, serve as pall bearers.

*Resolved*, That these resolutions, appropriately engrossed and signed by the officers of this meeting, be presented to the bereaved family, and that copies thereof be furnished for publication to the several telegraphic journals, and to the daily press of New York, Rochester and San Francisco.

"MR. CHAIRMAN—I have endeavored to express what I believe to be the sentiment of those who are here together to-day and those who have been so long associated with Mr. Mumford, and have done so to the best of my ability. The announcement of his death to me was a great shock; scarcely have I ever known an instance where the death of a person, not among my own family circle, has given me a greater one. And if the shock was great to us who were mere business associates and friends, what must it have been to those nearer and dearer than we? I move the adoption of these resolutions.

## REMARKS OF JUDGE O. H. PALMER.

"MR. CHAIRMAN: I feel myself entirely incompetent, upon an occasion so sad to me as the present one, to say anything; and yet I cannot allow it to pass without some expression of the sorrow that weighs upon all our hearts for the great loss we have sustained. Mr. Mumford was to me and my family as a son. I have known him from his birth nearly as well as I know my own children, and only to love him

as I love them. I well remember that many years ago when he was a mere lad I had the great misfortune to lose a dear boy, how he came to comfort me, telling me not to grieve, that he would hereafter be a son to me; and well did he keep his promise. He was such in my family and my affections. It is hard for me to realize—I cannot even realize that he is dead—that his cheerful voice will no more be heard—that the light of that happy, smiling face has gone out forever.

"The resolutions, Mr. Chairman, which have been offered, and the heartfelt words of Mr. Cornell by whom they were moved, are not extravagant eulogies. I speak, of course, with partiality, but with the experience of years and an intimate knowledge of the subject, and I am sincere in saying that in all my experience I never knew a more perfect character in all the relations of life. You know and I know that his untimely death is a great loss to the business in which he was engaged, and in which he labored with so much pride and zeal; that society suffers when a man in the prime of life, so well educated, with a mind so well balanced, so supported by a moral and religious character without stain or reproach, is thus suddenly stricken down. But what can we say of the greater sorrow that falls upon the bereaved family of whom he was the idol as well as support. To them this loss is irreparable; God alone can support and comfort them. All we can say is, such is the will of Providence, and we must submit. It is only a question of time with each of us as to when we shall go likewise.

## REMARKS OF DR. NORVIN GREEN.

"MR. CHAIRMAN—I should be remiss, much as I dislike to claim attention to anything I may have to say, not to bear personal testimony to the high character and great worth of the friend whose decease we are called to mourn.

Next to yourself, Mr. President, I presume no one has seen so much of Mr. Mumford during the last three years, or had such ample opportunity to observe his great business capacity, pure moral character and true unselfish friendships as I have.

In business he had more and varied capacities than any man with whom I have ever been brought in contact; always calm and self-possessed, clear headed and deliberate, never hasty or impulsive, his conclusions were formed upon thoughtful deliberation, and his action directed by careful consideration.

With a wide range of education and attainment, and a good knowledge of the law, he combined an excellent judgment and a creditable knowledge of practical telegraphy. Though always modest and unassuming, he had sufficient self-reliance to take responsibility when necessary, and executive force to carry his conclusions into faithful execution.

With a breadth of mind to compass great generalities, and the sagacity to gauge the effect of general policies, he combined the important elementary qualities of method, order and accuracy in detail.

But, with all his great capabilities, I was satisfied, and am now more satisfied, that he had assumed to do more than any one man could or ought to under-



take. His department of business was an immensely large one, and when there was added the Superintendency of the Eastern Division he had too much work, and, I have no doubt that the overwork he so cheerfully undertook, and so faithfully and efficiently performed, tended to exhaust his physical vitality and promote his early dissolution.

I must also bear testimony to the great loss this Company has sustained in his death. It is almost irreparable. I do not know any man capable of performing all the work that he did, and I think it would be very unwise to permit any one man to undertake it. His varied duties were full work for two first class business men. But, Mr. Chairman, we feel most keenly, and mourn his loss as an associate and companion; as a man of pure and guileless life, who never disappointed the just expectations of friendship. He had strong attachments, strong friendships, and as a friend, we most deeply mourn his loss, and pay the sad tribute which death has left to friendship. Amongst all this assemblage of his associates and friends, if any one had been called upon to select from the number the first likely to be summoned hence, I presume he would have been the last to be so indicated. His sudden demise has brought mortality more nearly home to me than any event that has occurred for many years, and has enforced reflections of the uncertainty of life and the liability at any time to be called away.

#### REMARKS OF HON. GEORGE WALKER.

"MR. CHAIRMAN—I feel myself highly favored in being asked to take part in this meeting of officers and representatives of the Western Union Company, which I attribute to the fact of my having been the immediate predecessor of Mr. Mumford in his office of Vice-President, and to the relations of close friendship which subsisted between us. I do not think there can be many persons outside of the circles of his relations, and of his official associates, to whom his death is more truly a personal loss than to me. When I came into the service of this company, Mr. Mumford was in California, in charge of the large and onerous share of our business pertaining to the Pacific coast. The wide distance which separated him from his associates in the management and from the executive officers of the company, threw him in an unusual degree on his own resources, and developed in him, if it did not partly create, those executive qualities which have distinguished him since he assumed a more responsible position in this city. I was greatly impressed in his correspondence during my own time in this office, with his sagacity, courage, prudence and executive talent, and with another quality most important in the head of a distant post—the power of clear, forcible and succinct statement, which was shown in all his letters. I recall, in this connection, some letters, only partly official, addressed to his uncle, Judge Palmer, from Oregon and British Columbia, on the occasion of an official visit there, which were admirable in description and of high literary merit. His thorough education and scholarly habits showed

themselves, in my intercourse with him, chiefly in an incidental way, by stamping with clearness, method, and precision whatever he did. I remember the surprise I felt when I first saw him, at the boyish appearance of the man whose admirable business qualities I had learned to respect so highly. I felt myself drawn to him at once, and our relations from the beginning, were those of intimacy and growing friendship, and confidence.

"I have within the last two years frequently met him in business matters outside of the Western Union Company, and have been gratified to observe, in all cases, that my own judgment of him was confirmed by that of all intelligent persons with whom he came in contact. At a very recent date, he had kindly consented to be a Director in a new institution of which I was to be the President, and in the organization of which his counsel and assistance has already been seriously missed. His election to this office occurred only two or three days before his death, and from the necessity of presenting a complete list of Directors to comply with the law, (the vacancy occasioned by his death not having been filled), his name now appears with those of his associates in the public announcements of the company."

"In conclusion permit me to say, that it is to the selection of such men as Mr. Mumford, highly trained, intelligent, devoted to the interests entrusted to them, and not self-seeking, that the Western Union Telegraph Company owe much of the high place which it holds in the estimation of business men, to whom the absence of these qualities has been too often brought home in a signal and painful manner.

Mr. GROSVENOR P. LOWREY then addressed the meeting as follows:

MR. CHAIRMAN—I have listened with great satisfaction to the words of praise of the character of Mr. Mumford from the various gentlemen who have spoken. I feel an interest in these remarks, which is not always permitted to those who attend meetings of this sort and which arises from the fact that I am entirely sure that every eulogium is earnestly felt and believed by every speaker and listener. The fact is, Mr. Mumford was indeed all that has been said of him; a man of unqualified merits, to whom unqualified praise might be conscientiously applied. His capacity is proved by the greatness of the affairs which he successfully conducted. Such business as he undertook and conducted is not possible to men of limited or undisciplined abilities. He had great natural powers, greatly enhanced by judicious culture. But most happy in all this rare conjunction of high qualities he was, as has been said, a man without guile. This absence of guile implies, however, no ignorance of human nature; and it would be difficult to find one better qualified to defend himself or the interests confided to him against guilefulness of other men than he. He knew the evils of the world and was fully capable to defend himself and his friends against them, but he neither participated in or took advantage by them himself. His

interior nature was sweet and fresh as the innocence of youth; a constant charm to whoever was capable to perceive such excellencies, while his intellect had the expansion, the depth and the strength which belongs to great experience of the world. Doubtless those gentle and pure characteristics stand him now in great stead in the new life upon which he has entered as those other qualities stood him in great stead in all the trials and difficulties of this life.

#### MR. JAMES D. REID'S REMARKS.

"MR. CHAIRMAN: The officers, ex-officers, and counsel of the Company having expressed their sentiments of love and admiration for the departed, in which, I am sure, we all cordially unite, perhaps I may be allowed on this sad occasion to say a single brief word as the representative of the Company's subordinates. I do so under the stimulus of two thoughts, which, in the solemn circumstances of this hour, seem to ask expression. There may, perhaps, be lessons to be learned in this hour of common sorrow other than those which the simple fact of death naturally inspires.

"The first thought is this. There is a relation existing between the executive officers of this Company and its subordinates throughout this wide continent which identifies your names to us with the honor, the success, and perpetuity of the business. The rank and file of this great Company are like sailors who go out to sea, to meet its storms, trusting in the skill of the commander. It is not a matter of light moment, therefore, to any of the thousands who serve you when an executive officer falls at his post. It brings to them all—to the operator out on the prairie as to me sitting near the Executive door—a secret dread—a feeling of insecurity—a sense of unrest. The lives of the men who direct this Company are, in some sense, the property of all. You inspire our labor; you stimulate our ambition; you touch our daily bread. The pulse and power of this whole vast system which vibrates from sea to sea is felt to be here. The death of a distinguished officer, therefore, such as he who so lately sat here in the early prime of a manhood so full of promise is a universal sorrow.

"The second thought I hesitate to express, and yet I trust myself to utter it. To me the executive rooms of the Company have been places I have seldom entered, and which during many years I shunned. There has been about them, somehow, more so in past years than now, a shadow as of death. When impelled by duty to meet an executive officer I have found myself in the presence of a man on whose pale brow, in whose wearied or intensely preoccupied eye I read the strain of oppressive official care. I was not surprised when sometimes the uplifted hand and the deprecating face waved me off as if even my light errand was too much to add to the pressure of other claims. The duties of the Executive of this vast Company have been enormous and exhaustive to the last degree. They have, to my mind, improperly imperiled valuable life. Gentlemen, it is within your knowledge, that not for the first nor the second nor the third time the chief offi-

cer of the Company has been brought, by excessive toil of hand and brain, to a face to face wrestle with death, and only won by the skin of his teeth. And it will not be known until the resurrection morning how far the death of the bright young man who so recently filled that chair was the result of the undue pressure of official labor. It may be that what we to-day mourn as death was, in fact, murder. I use my liberty, therefore, in this solemn presence to ask if this vast Company requires this peril of life? Does it not seem wiser that in the wider distribution of official labor, committing to many what is now assigned to so few, valuable lives may be protected, and success be not built at the expense of broken intellects and opening graves. The centre of so benign a system should be radiant with health and cheerfulness and welcome.

"Of Mr. Mumford I have nothing to add to what has been already so well expressed. His death is a loss to us all. His memory will be fragrant long after his body shall have been consigned to its last resting place, as one highly gifted by nature and faithful in all his public trusts."

The resolutions were then unanimously adopted and the meeting adjourned.

## CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

Will you be kind enough to state in the JOURNAL the length of the telegraphic line across the isthmus, from Aspinwall to Panama. Also who owns or controls the same. J.

*Answer*—The length of the line from Aspinwall to Panama is 47 miles. It is owned and controlled by the Panama Railroad Company and is under the charge of the superintendent of the railway.

To the Editor of the Journal of the Telegraph:

Not long since I received a collect message on which charges were guaranteed at originating office. On delivering message I could not collect charges. The manager under whom I worked said I should not have delivered the message as we could not hold the originating office for the tariff after delivering. I claim that a guaranteed message should be delivered anyway. Please answer. O. B.

*Answer*—A collect message on which the charges are guaranteed should be delivered even if payment be refused. The guarantor is responsible for the tolls.

W. P. says: I am working on a method of multiple transmission. The operation is dependent on a principle that I do not find treated at length in the books that I have consulted, and I write to ask an explanation from you, or at least desire that you will refer me to works that treat of the matter definitely. The point is this: Pass through an ordinary relay a weak local current, just sufficient to operate the armature promptly. In lieu of the usual tension spring use a lever, upon which place a weight, adjusting it so as to balance the force of the magnet. Call the weight 8. Now, if in this circuit we place a revolving circuit-breaker having a periphery of say 19-20th conducting surface and 1-20th break—the effect being to pass through the relay a circuit broken at rapid intervals—we shall find the effective force of

the current upon the magnet and armature reduced from 8 to say 1 (the proportion of reduction increasing with the weakness of the normal current, approximately). This enormous reduction is out of all proportion to the actual amount of electricity taken from the current by the break, thus:

A constant current of (say) 20, gives effective force of (say) 8. A current of  $\frac{19}{20}$  duration, instead of 20 giving  $(\frac{19}{20} \times \frac{8}{1}) = 7\frac{1}{5}$ , gives but 1.

This being a fact (as I find by experiment), reasoning conversely, we should be able, by passing a series of short impulses from a line wire through the same relay, occurring at the points of breakage of the local current, to *vitalize* the local current, increasing the effective force from 1 to 8, so long as the short impulses from line wire occurred at the breaks in the local circuit, as shown in sketch. This assumption is proven to be correct by experiment, and I am able to divide a line current into (say) 8 parts, giving to each instrument a current, not constant, as in the usual Morse circuit, but composed of a series of very short impulses, which, by the use of the broken local current, as described, produces an effect on each of the receiving relays equal to a constant current.

As said, I do not find anything in the books concerning the proportionate decrease of effective force of a given current by interposing breaks of very

short duration, say  $\frac{19}{20}$  continuity and  $\frac{1}{20}$  break, and

I desire to be enlightened as to the cause of the apparent anomaly.

I am aware that Farmer, in 1853, made experiments in multiple transmitters, much on the same general plan as I am working on, i. e. the division of current among a number of instruments; but, if we reduce the effective current from 8 to 1 by

taking from it but  $\frac{1}{20}$ , leaving  $\frac{19}{20}$ , what can we expect

when we divide it among a limited number of instruments, say 4, in which case each would have

$\frac{1}{4}$  but—? No practical effect could be attained, and I

presume this was the cause of Farmer's failure.

*Answer*—The decreased magnetic effect which you observed in your experiments with the revolving circuit-breaker, appears to be attributable to at least two causes: Induction, including both the extra current and the reaction of the developing magnetism in the core, and also what Poisson calls the "coercive force," but which is perhaps better expressed by the "magnetic inertia" of the particles forming the core.

Of course, by decreasing the velocity of the circuit-breaker, the magnetism of the core could be made to attain its maximum.

Under the head of Electro-dynamic Induction, Blavier, in his work on the Telegraph, alludes to this subject—Tome 1, sec. 431. Du Moncel, also, in the 3d edition of his Exposé, Tome 2, page 47, treats pretty fully of the laws influencing the velocity of magnetisation and demagnetisation of cores.

We doubt not that you will find in these a satisfactory explanation of the apparently singular results which you have obtained.

Accurate knowledge is the basis of correct opinions. The want of it makes most people's opinions of little value.

## EASTERN TELEGRAPH COMPANY.

At the sixth ordinary general meeting of the Eastern Telegraph Company, the chairman, in moving the adoption of the report, said it and the accounts showed that the income amounted to £200,000, and the expenses to £52,000, leaving a balance of £147,000, of which amount £12,831 had been absorbed by special expenditure during the half year. The directors now recommend a final dividend of 2s. 6d. per share, making, with the three previous payments on account, a total dividend for the year of 5 per cent., carrying £35,933 to the reserve fund, increasing that fund to £159,522. No doubt the question would be asked why the dividend was 5 per cent. instead of 6 per cent. as in the last year, and he would come to the point at once and state why the dividend was reduced. The repairs of the cable during the last year amounted to something like £42,000, in the previous year to £30,000, whilst last year they amounted to £12,000 more, and that accounted for the decrease in the dividend. They had carried a goodly sum to the reserve, and there was a very general feeling abroad that, looking to expense of maintaining the cable, they should look to larger reserves, and probably not to higher dividends than the dividend proposed that day. There was another circumstance which had considerably affected the company's income, and that was the bad trade which had prevailed generally throughout the world. There was another source of expense: they had opened up a new system to Egypt through France, which had been done at a cost of something like £12,000 a year, which had given great facilities for carrying the traffic, and no doubt the shareholders would shortly reap the benefit of the expenditure. The system through France had enabled the company to utilise, to a great extent, the Marseilles line, which otherwise was but partially employed. There was very little encouragement to competing companies to take the field against this company in that particular line; for if the competing companies laid cables to day, and had half the present tariff in that direction given them, they would not pay their expenses. They had also added to the system the Sardinian-Tuscan line, which was complete; but the directors had no anxiety on that point, as they were guaranteed 14 per cent. upon it, and it was going to be paid for by bonds. The principal expense upon repairs was on the Lisbon cable—the Lisbon section of the Atlantic cable, which was probably caused by the cable having been in the first instance laid on bad ground, besides which there were currents which the company was not aware of at the time when the cable was laid. The Red Sea cable had cost the company comparatively nothing, and the other Mediterranean cables had cost the company but little. None of those cables had shown any signs of deterioration: on the contrary, the experience was that the longer they were laid the more they were improved. He hoped and believed that, as the time went on, there would be a larger amount of telegraph traffic. In conclusion, the chairman moved the adoption of the report and accounts, and the declaration of a dividend of 2s. 6d. per share.

Lord William Hay seconded the resolution, which was put and carried, after some discussion.

A vote of thanks to the chairman closed the proceedings.

An interruption has occurred to the Scilly Islands Cable. The fault is supposed to be about 200 yards from the landing place in the Scilly Isles. During the interruption messages are forwarded via Port Penzance.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

## EXECUTIVE OFFICE.

WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, August 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Hereafter the "tariff for other lines" from Columbus, Ga., to Union Springs, Ala., will be 40 and 3. Messages for Union Springs may be sent via Montgomery, Ala., "tariff for other lines" 30 and 2.

Tuskegee, Ala., closed.

Hereafter the "tariff for other lines" from Little Rock, Ark., to points given below will be:

Conway, Ark., 25 and 2.

Morrilton, 25 and 2.

Russellville, 30 and 3.

Altus, 50 and 4.

Customers offering messages for East Lyme, Conn., to be delivered by stage from Niantic, should be informed that the daily stage from Niantic leaves at noon.

Canterbury, Del., reopened.

Pryor's Station, Ga., closed.

Messages taken for Steel's Mills (office noted as closed in JOURNAL, July 1st, 1874) and Percy, Ill., should be sent and checked to Tamarora.

Sand Creek, Ind., closed.

Marion, Md., closed.

Logan, Mo., closed.

Barnaby's River, N. B., reopened.

Gorham, N. H., should, until further notice, be checked exclusively as an office of the Montreal Telegraph Company. Tariff for other lines 25 and 1 from Portland, Me.

Messages taken for the following places in N. H., will be delivered from Lawrence, Mass., by special messenger or by trains (the latter leaving Lawrence, Mass., twice daily, at 1 and 6 P. M.) Charges for delivery as follows:

	Special messenger.	Train.
Salem Depot,	\$2.00	15 cents.
Salem,	2.50	—
North Salem,	2.50	—
Windham,	—	15 cents.

Clinton, N. J., is now a W. U. Office in square 52, check direct.

Messages for Greenville, N. J., will hereafter be delivered from Bergen Point. Charges for delivery fifty cents.

Business for Palmyra, N. J., will hereafter be checked to Riverton.

Squan, N. J., closed; business will hereafter be mailed from Freehold. Postage should be charged.

Essex, N. Y., closed.

Fairpoint, N. Y., reopened, square 139. Check Mayville.

Ghent, N. Y., closed.

Belle Centre, O., is now a W. U. Office, square 212. Check direct.

Carey, O., is now a W. U. Office, square, 221. Check direct.

Cumminsville, O., is now a W. U. Office, square 233, tariff same as Cincinnati. Check direct.

Kenton, O., is now a W. U. Office, square 212. Check direct.

Berwick, Ont., closed.

Brady's Bend, Pa., closed. Messages are now delivered from East Brady's Bend.

Gibsonburg, Pa., changed to Jermyn.

Hillville, Pa., closed.

Monterey, Clarion Co., Pa., reopened, check direct.

Reimerton, Pa., closed.

Linwood, Pa., reopened.

Sligo Furnace, Pa., will hereafter be in square 140. Messages taken for Bower's Sta., Berks Co., Pa., are now mailed from Lyons. Postage, four cents.

The name of the office at Delaware Water Gap, Pa., is incorrectly given in tariff book as Water Gap, it should read Delaware Water Gap.

Sandy Bay, Que., closed.

St. Esprit, Que., reopened.

Attention of offices is again called to the notice in JOURNAL of March 15th, 1873, giving Bethel Springs as the post office address of Bethel, Tenn.

Morristown, Tenn., reopened.

Savoy, Texas, reopened, tariff same as heretofore.

Longdale, Va., closed.

Hereafter the "tariff for other lines" from Cheyenne to Pine Bluffs, Wyo., will be 45 and 3.

## NEW OFFICES.

\* Clarksville, Ark., 50 & from Little Rock.

53 Woodside, Del.

262 Strawns, Ind.

456 Rosedale, Ks.

234 Paint Lick, Ky.

60 Hillsboro', Md.

85 Emory Grove Camp, Md., check Reisterstown.

334 West Pascagoula, Miss.

\* Bay Roberts, Newfoundland.

41 Orange Junction, N. J.

45 Crescent, N. Y.

65 Conklin, N. Y., check Great Bend, Pa.

\* Hunter, N. Y., 40 3 from Rondout.

\* Windham, N. Y., 40 3 "

\* Ameliasburg, Ont.

\* Curran, Ont.

\* Fitzroy Harbor, Ont.

\* Hallville, Ont.

\* Riceville, Ont.

\* Victoria, Ont.

140 Atlantic Pipe Station, Pa.

\* Jermyn, Pa., (formerly Gibsonburg) 20 2 from Rondout, N. Y., Scranton, Pa., or Honesdale, Pa.

151 Mahoning, Pa.

\* Danville Village, Que.

\* L'avenir, Que.

\* St. Stanislas, Que.

\* St. Thomas Village, Que.

\* Ulverton, Que.

\* North Mountain, Va., 40 3 from Richmond.

486 Dodge, Texas.

\* Griffin, Texas, 25 1 from Denison.

451 Waskoms, Texas.

Government messages for all offices in Arizona and any of the following named offices in California, Indian Territory and Texas will hereafter be charged for, at government rates, from the originating office to destination. Heretofore the rule has been to accept government messages as free over government lines charging for "this line" only.

Campo, Cal.

Fort Sill, Ind. Terr.

Graham City, Texas.

Henrietta, Texas.

Jackaboro, Texas.

Pilot Point, Texas.

Griffin, Texas.

## TO SPECIAL OFFICES.

Managers of offices whose rates to Brooklyn, So. Brooklyn, Williamsburg, Greenpoint, Bushwick, Astoria, Hunter's Point, Fort Hamilton and Flatbush, N. Y., are found by adding to the rate to New York City should bear in mind that the rate to those offices are affected by a change in the rate to New York. Offices within fifty miles of the places named will continue to charge the local rate of 25c. or 30c. as at present without regard to changes in the New York rate.

The rates to Harlem, Manhattanville and Yorkville should be the same as the rate to New York.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, August 16, 1875.

To all Transfer Agents:

Petroleum Centre, Pa., has been discontinued as a money transfer office.

WILLIAM ORTON,  
President.

It has been decided that the next International Telegraph Conference shall meet in London in 1878.

A message from Montevideo announces the completion of the last section of cable between that city and Cluny, close to the Brazilian frontier, where the Western and Brazilian Telegraph Company's system begins. The portion just finished belong to the Montevidean and Brazilian Telegraph Company, which was taken over by the Platino-Brazilian and Western Brazilian Companies. Direct communication from England is now opened, not only by the River Plate region by way of Brazil, but also by the overland wire with Chili, which is traversed by telegraphic lines from Valparaiso southwards to Talcahuano, and north to Caldera.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT NOTICE No. 77, ISSUED AUGUST 2, 1875.

## DEATH OF JOHN TREVOR.

John Trevor, of Rochester, N. Y., (Certificate No. 484, issued March 26, 1869), died in Rochester, July 5th, 1875, of Peritonitis.

Mr. Trevor, formerly a telegraph line repairer, was at the time of his death a bank patrolman in Rochester, and was shot by a man who had escaped from custody and whom he was attempting to arrest.

One dollar for assessment 77 is due from members holding certificates numbered up to and including No. 2,468.

## RECEIPT OF ASSESSMENTS.

New York, August 10, 1875.

## ASSESSMENT No. 77.

4, 16, 21, 28, 53, 64, 74, 77, 82, 86, 88, 90, 103, 131, 138, 140, 143, 157, 181, 208, 211, 217, 269, 274, 277, 289, 301, 319, 332, 361, 383, 416, 434, 464, 467, 476, 509, 526, 536, 547, 549, 553, 564, 565, 575, 594, 597, 604, 622, 626, 646, 649, 703, 721, 731, 740, 742, 787, 804, 830, 832, 843, 859, 901, 911, 915, 916, 917, 923, 977, 1011, 1024, 1039, 1054, 1081, 1126, 1143, 1148, 1154, 1173, 1178, 1183, 1182, 1185, 1199, 1205, 1225, 1252, 1266, 1289, 1298, 1300, 1306, 1333, 1345, 1357, 1394, 1398, 1402, 1403, 1404, 1407, 1409, 1410, 1490, 1502, 1503, 1516, 1527, 1560, 1568, 1571, 1579, 1615, 1623, 1625, 1635, 1830, 1831, 1852, 1894, 1901, 1944, 1957, 1964, 1986, 1995, 2019, 2029, 2030, 2049, 2066, 2069, 2082, 2097, 2133, 2135, 2141, 2162, 2164, 2172, 2174, 2175, 2178, 2212, 2214, 2228, 2229, 2233, 2239, 2240, 2242, 2259, 2279, 2281, 2282, 2283, 2287, 2305, 2322, 2337, 2343, 2346, 2352, 2380, 2390, 2391, 2396, 2397, 2400, 2403, 2412, 2413, 2414, 2427, 2428, 2435, 2442, 2444, 2445, 2450, 2455, 2468, 2469, 2470.

## ASSESSMENT No. 76.

27, 39, 228, 237, 238, 242, 246, 258, 273, 294, 347, 392, 393, 394, 402, 441, 451, 453, 455, 457, 542, 556, 557, 652, 661, 692, 701, 710, 722, 766, 781, 783, 786, 802, 809, 835, 838, 871, 906, 926, 944, 980, 1000, 1002, 1014, 1016, 1041, 1135, 1138, 1136, 1141, 1196, 1255, 1256, 1277, 1281, 1283, 1284, 1285, 1288, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1366, 1385, 1390, 1391, 1405, 1427, 1430, 1432, 1433, 1444, 1465, 1469, 1471, 1474, 1476, 1481, 1513, 1558, 1573, 1586, 1616, 1619, 1649, 1666, 1673, 1700, 1701, 1704, 1715, 1716, 1731, 1737, 1746, 1747, 1778, 1785, 1786, 1828, 1854, 1874, 1876, 1982, 2023, 2037, 2050, 2063, 2085, 2120, 2177, 2182, 2227, 2257, 2269, 2280, 2284, 2286, 2293, 2309, 2320, 2325, 2326, 2328, 2353, 2360, 2364, 2365, 2398, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2425.

## ASSESSMENT No. 75.

100, 569, 574, 870, 942, 1164, 1207, 1237, 1238, 1270, 1609, 1660, 1661, 1662, 1663, 1844, 1845, 2128, 2131, 2167.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

## TELEGRAPHERS' ENTERTAINMENT.

The Telegraphists of Buffalo, Toledo and Erie were handsomely entertained at Cleveland, Ohio, on July 4th and 5th, by the Telegraphers' Association of that city. On the evening of the 5th, before leaving for their homes, the visiting guests gave expression to their appreciation of Cleveland hospitality in the following preamble and resolutions:

Whereas, We, the telegraphers from Buffalo, Toledo and Erie, having received and accepted invitation from the Telegraphers' Association of Cleveland, deem it proper to offer the following—

Resolved, That the thanks of the visiting telegraphers be and are hereby tendered to the members of the Telegraphers' Association of Cleveland for the very cordial reception and princely hospitality extended to us during our stay in their beautiful city.

Resolved, That our thanks are due and are hereby tendered to the Lake Shore Railroad Co., Messrs. J. H. & Randal Wade and to others for favors received.

Resolved, That these resolutions be published in the Buffalo, Cleveland, Erie and Toledo papers and the JOURNAL OF THE TELEGRAPH.



## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

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Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, AUGUST 16, 1875.

The steamship *Gellert* of the Hamburg line, which arrived at this port on Tuesday evening last, had on board the remains of the late Mr. G. H. Mumford. The body was received at Hoboken by the committee appointed at the meeting of his friends and associates, and placed in the receiving vault of the chapel of Christ Church, in this city, where it will remain until Monday, when the committee will escort it to Rochester, N. Y., where the final interment will take place on Tuesday, August 17th.

The *Faraday* sailed from England on Friday, 13th instant, to renew operations for the repair of the injured portion of the Direct United States Cable.

A new departure in Life Insurance is announced by the Provident Savings Life Assurance Society, a company which has just begun business in the Western Union Building. Mr. George Walker, its President, was formerly a Vice-President of the Western Union Company, and Mr. Sheppard Homans, its Vice-President and Actuary, stands at the head of his profession. The list of Directors chosen last month contains the names of our Vice-Presidents, Cornell and Mumford, and of many other gentlemen of intelligence and influence in this city.

The plans of the society embrace several novel and attractive features which seem to recommend it strongly to persons of moderate incomes. It proposes to issue policies for a single year, renewable as long as the assured desires without new medical examination, and to exact only the premium of the year, so that the assured is not obliged to pile up money in the company's hands for the insurance of years which he may not live to attain. Any excess beyond the cost of the year will be divided back to the assured or applied on his next premium. It would seem to be a system admirably adapted to the wants of telegraph men.

We shall speak more at length of it hereafter.

### THE TRUTH ACKNOWLEDGED.

It is at last acknowledged in Parliament and by the leading English newspapers that the system of postal telegraphs in which the government of Great Britain was induced to embark, and which was inaugurated so confidently, is, financially considered, a complete failure. The capital stock created in respect of money raised for the purchase of the telegraphs amounts to \$18,950,990, and besides this there are claims, some of which are in course of settlement and others yet untouched, which will swell the total several millions more. On this sum the government pays 3 per cent. interest, which should be met by the earnings of the telegraph. For the year 1874 this interest amounted to \$1,468,530, while the surplus revenue was only \$545,805, being \$922,725 less than the interest payable. Previous to 1874, there was a deficiency of a like kind amounting to \$1,443,035, so that the accumulating deficiencies of telegraph revenue, to meet the interest on the capital, amounted to \$2,385,750 at the end of that year. The deficiency is really larger, as some telegraph charges are borne by the Office of Works, and the unsettled claims of the railroad companies are not embraced in this account.

With these unpleasant facts before him, it is not surprising that the Chancellor of the Exchequer, in his formal speech upon the receipts and expenditures of the country, took a gloomy view of the future of the postal telegraph system, instancing it as a warning to Parliament not to embark in other schemes of a like character. The *London Times*, hitherto a strong supporter of the measure and a ready apologist for the short comings and the scandal which was evoked by the misappropriation of funds from the Savings Bank department of the Government to cover telegraph deficiencies, is forced to acknowledge that the system has disappointed anticipations and that the time is coming when the rates now charged will cease to pay, and unless a great change is made the service will become a heavy and increasing charge on the finances of the country. We think it is apparent that the time is already come when the system is a heavy and increasing permanent charge. No further time is necessary to demonstrate that fact. It appears evident, too, that steps in the direction of some change are being taken, if there is any truth in the statement that Mr. Scudamore is about to take charge of the postal arrangements of the Porte. But a change in men will not accomplish the reform. The lines, probably, could not be better officered than they are.

The only way in which the service can be made self-sustaining is by increasing the rates until they reach a remunerative point. When this is done it will be found that the telegraphing public will not have derived the benefit promised by the change from private to public ownership, while to the Government, from this speculative error, will attach the unenviable distinction of having increased national taxation by the unnecessary destruction of private enterprise.

### CARD FROM PRESIDENT ORTON.

In regard to the rumors of pending consolidation of the Atlantic and Pacific Telegraph Company with the Western Union, and the insinuations reflecting upon the motives and the supposed action of the officials of the latter Company, President Orton, on Thursday last, published the following card in the *Commercial Advertiser* of this city:

"For several weeks past the financial columns of the *Commercial* have contained frequent mention of my name in connection with allegations and insinuations to the effect, substantially, that I had entered into a conspiracy, or an arrangement, or was a party to an understanding with Mr. Jay Gould looking to the turning out of certain of my present associates in the Western Union Board at the annual election in October and the substitution of Mr. Gould and his friends. Concerning these allegations and insinuations, the latest of which appeared in the *Commercial* of yesterday, permit me to say:

*First:* It is not true that I desire to be rid of any of my associates in the directory of the Western Union. If I have any cause of complaint concerning their conduct toward me, it is that they have been far too lenient and confiding in the adoption of my plans, and in putting upon me the sole responsibility of carrying them out.

*Second:* It is not true that I have an arrangement or understanding, expressed or implied, with Mr. Gould or with any person in his behalf, or with any other person concerning what shall be done at the annual meeting of the stockholders of the Company in October either in respect to directors or officers then to be chosen.

In view of the fact that I have been chosen President of the Company by a unanimous vote at every election since the first, and that, too, without solicitation or effort on my part, it has not occurred to me that it would be necessary to enter into a combination now to prevent my "decapitation."

No one will question the right of Mr. Vanderbilt and his friends to sell their Western Union shares whenever they choose, nor the right of Mr. Gould to purchase such shares, even to the extent of a controlling interest. But I will say frankly that I should be sorry to part company in business with Messrs. Vanderbilt, Schell, and Banker, whose names have been mentioned in the *Commercial*, and I would not willingly exchange them for any of the parties who have been named as their probable successors. And now that I am, metaphorically, on my legs, let me add, touching the rumors as to telegraph consolidations: The Western Union Company can use to advantage, and may absolutely require, within the next 12 months, 10,000 miles of additional wires. If these additional facilities can be acquired of companies now using them in competition with us cheaper than we can erect them, clearly it would be for our interest to buy out such companies rather than to erect new wires. But we have made no proposition for the purchase of any competing lines, and no proposition has been made to us that would be for the interest of the Western Union to accept. Very respectfully,

WILLIAM ORTON."

We learn that the Electrical Construction and Maintenance Company of San Francisco have contracted with the Los Angeles and Independence Railroad Company for the construction of a telegraph line from Santa Monica to Los Angeles, as soon as the material can be obtained. Mr. Haines will superintend the construction of the new line.

# ACTION OF THE EXECUTIVE COMMITTEE ON THE DEATH OF MR. MUMFORD.

At a meeting of the Executive Committee of the Western Union Telegraph Company, held on Wednesday, Aug. 11, President Orton announced, with feeling and appropriate remarks, the death of Vice-President Mumford, the Secretary of the Committee and of the Company. Whereupon, a committee composed of Dr. Norvin Green, and Hon. A. B. Cornell, was appointed to draft suitable resolutions expressive of the feeling of the Executive Committee at the great loss which they had sustained.

The following are the resolutions, which were unanimously adopted :

George Hart Mumford is dead ! In the Providence of God, our associate in business, our friend and companion in the walks of social life, has been taken from us. A busy life is closed ; a splendid officer has been stricken down and a just man has been summoned to his last account. A ripe scholar—an accomplished gentleman—a business man of the clearest perception, the soundest judgment and the most unquestionable integrity, has been cut down in the flower of his youth and in the midst of a bright career of usefulness and honor.

Language can neither express our grief at the loss we have sustained, nor add lustre to the name, which, by the force of his own genius and scholarly attainments, he has carved among the names of the best and ablest men of his country and his profession.

Mr. Mumford was the youngest of the executive officers of the company ; yet he was, at the time of his death, one of its Vice-Presidents, one of its General Superintendents, and its Secretary. He also had charge of the money Transfer Department, an important branch of the service, which he had perfected and managed with great skill. He was not only faithful to every trust committed to him, but he was eminently efficient in the performance of all the various and complex duties which he had assumed.

Genial as the sunshine and gentle as a child, yet he was bold, resolute and energetic. Whatever measure his mind conceived, his hand was always ready to carry into execution.

It is to the memory of such a man that we are called upon to pay the last sad tribute which death concedes to friendship.

*Resolved*, That we, his immediate associates and friends, who best knew, and most admired and loved his exalted qualities of head and heart, record our undivided testimony to his great worth, and our heartfelt sorrow at his untimely death.

*Resolved*, That as an officer and associate in the management of this corporation, he was able, efficient and faithful. He grasped the scope of its great business and its vast interests with masterly power, whilst he pursued the intricate and bewildering details of the service with unerring accuracy, untiring diligence and unquestioned integrity. Possessing the genius to design and the ability to execute, he combined extreme modesty with uncommon sagacity and wisdom.

*Resolved*, That we extend to the bereaved family of the deceased our heartfelt sympathy in the grievous trial with which it has pleased Divine Providence to afflict them, and we humbly commend them to the holy care of Him who is the refuge of the distressed and in whose hands alone are the issues of life and death.

At the General Term of the Superior Court of New York, last week, Judge Curtis rendered a decision of

some interest to the mercantile community who have occasion to use the telegraph in their business transactions. The Court held that a telegraphic dispatch agreeing to accept a draft is equivalent to a written promise to accept, and under the statute makes the person sending the dispatch liable as acceptor. The law thus sanctions what could hardly be seriously questioned, that if a written promise is legally binding, it is equally so when sent by telegraph as when sent in any other manner.

## THE PRACTICAL WORKING OF A GOVERNMENT TELEGRAPH.

*To the Editor of the Evening Post :*

The recent announcement in the *London Times* that the postal telegraph system in Great Britain has proved a financial failure, and that unless a great change is made the service will become a heavy and increasing permanent charge on the country, will not surprise any one who has carefully studied the results of government management of business matters of any kind ; but the history of the absorption of the telegraph by the British government in 1870, and its union with the Post Office, is full of interest and instruction as showing how the judgment of the most able and best-informed may err when brought to bear upon a question in which personal interest has become involved.

The assumption of the telegraph by the English government is mainly due to the efforts of one man—Frank Ives Scudamore, C. B., second secretary to the Postoffice. Mr. Scudamore is an accomplished English gentleman, of that thorough training which English men of business receive. He has been connected with the Postoffice Department since 1840, and knows it thoroughly. In 1860 he began to study the subject of uniting the Postoffice and telegraph in England, which he became much interested in. He went abroad and examined all the systems of the Continent, and also sent experts from the Postoffice to investigate them. He spent five or six years in a careful study of the subject—a study such as is very seldom given here to any question of administration ; and then began to agitate the question before the public, and, finally, before committees of Parliament. In his first estimate, after years of study and examination, he put the cost of the telegraph at £2,400,000. This he subsequently increased to £3,000,000, then to £3,600,000, and finally to £6,000,000, which he said was the outside figure. A report from the Receiver and Accountant-General of the Postoffice, ordered by the House of Commons to be printed July 8, 1875, shows that the expenditures up to 31st December, 1874, amounted to £9,857,800, while there are outstanding claims against the department for £4,000,000 more.

In July, 1866, Mr. Scudamore estimated the annual expense in working the telegraph at £456,000, and in July, 1868, at £379,000, the difference being attributable to more accurate information as to the saving to be effected by a consolidation of the lines under government control. The report above mentioned shows that the amount expended by the Postoffice from the 1st January, 1874, to 31st December, 1874, for salaries, rent and maintenance of telegraphs was £1,051,376, exclusive of £20,000 for repairs of line, and £10,950 expended for new offices.

In Mr. Scudamore's testimony before the Parliamentary Committee, July 9, 1868, he said : My object has been to convince the committee that they may, with almost entire certainty, rely upon a net revenue within a range of from £200,000 to £360,000, the mean of which is £280,000 ;" and he added, "I should like to say one word with reference to the

discrepancies that are sure to be discovered some day or other between the different estimates which I have made of the capital and of the amount which will probably have to be paid ; and it is this, that if hereafter we have to give more than I have at any time mentioned, it is really because in giving a greater sum we are going to get a greater sum for it than I have ever supposed it possible we could get. We are going to buy a greater trade than I thought there was in the country." To pay for the telegraph the British government issued stock (consols) bearing interest at 3 per cent, which was to be repaid out of the profits of the business. The report previously referred to, dated at the Treasury, Whitehall, 3d July, 1875, states that the interest for the year 1874 on the capital stock thus created amounted to £293,705, while the amount of balance remaining applicable to pay it was only £109,161, or if the amount expended for repairs of line, and for new offices was deducted, there would remain only £77,633, leaving a deficit in a single year's interest on the cost of the property at the low rate of 3 per cent. of £216,072.

The above result I think clearly shows the wisdom of the American press in so generally and persistently opposing a similar experiment in this country.

GEORGE B. PRESCOTT.  
Electrician's Department, Western Union Telegraph Company, New York, August 9, 1875.

## A GOVERNMENT TELEGRAPH IN OPERATION.

Mr. George B. Prescott presents in another column of this journal a very succinct statement of the practical financial operation of the government telegraph system in England. The result has shown how far short the most careful efforts to estimate the first cost of the telegraph to the government came of the exact amount, and how unprofitable, in a business sense, the property under government management has been. The extreme estimate of the cost was \$30,000,000; the actual cost up to 1874 had been nearly \$50,000,000, with outstanding claims amounting to \$20,000,000 more. The estimate of the cost of working was \$1,895,000 a year; the actual cost in 1874 was more than \$5,000,000, exclusive of \$150,000 additional for repairs and new offices. The net revenue predicted from the business was \$1,400,000; the report of July 3, 1875, shows that the net revenue has failed by more than \$1,000,000 to pay interest at the rate of three per centum on the stock by the issue of which the purchase of the lines were made. Thus, after a practical trial, in a country whose civil service is almost entirely removed from the reach of the politicians, it has been found that a telegraph system controlled by the government does not pay its expenses. It might do this and yet be a failure because of the poor quality of its service, and because of the additional opportunity which it would give the professional politicians, under such a government as ours, for interfering with the public business and thus increasing the political corruption of the country. But to fail financially is to fail radically, unless we accept the soundness of the doctrine that it is right to tax a whole nation to support a business the benefits of which accrue to a small minority.

The *Witness*, referring to a recent editorial article in the *Evening Post*, says:

"The *Evening Post* points to the collusion, corruption, swindling and stealing in connection with the New York canals, and says that this should deter us from government telegraphy. If this argument be good against government management of telegraphy, it proves too much, for it is equally good against government management of the post-offices."



We might reply that the *Witness* proves too little. Financially considered, our postal service is a failure, every annual report showing a deficit. This is the case, too, with a necessity on the part of the government of owning and keeping in repair long lines of railroads and a vast amount of rolling stock, as it would have to own and repair long lines of telegraph wires with their equipment if it undertook the business which the *Witness* proposes. It is by no means an undisputed question whether the mail service could not be as efficiently and more economically performed by a private corporation. It has, however, in its present shape grown with the government, and its existence as a government business is no argument at all in favor of other projects to increase the taxes.—*Evening Post*.

ON DETERMINING THE QUANTITY OF MAGNETISM OF A MAGNET.—*R. Blondlot*.—Referring to M. Rothlauf's discussion in 1861 (*vide Annales de Poggendorff*), on Mr. Van Rees's method of investigating magnetic depth in magnets from its power of generating induced currents, the author declares the theory faulty in two points, and continues: "It may be interesting to examine, from a theoretical point of view, Mr. Van Rees's method; to seek out the exact signification of the numbers which it gives; and in particular to treat of one case where (though it be in general inexact), its application does not entail any appreciable error." The method in question is to insert in a coil, whose wire forms a closed circuit through a galvanometer, a bar magnet, and then sharply to withdraw it to a great distance; the strength of the induced current becomes the measuring quantity. The lesson learnt from the paper is that, "in a long magnet the magnetism may be considered as accumulated in the neighborhood of the extremities; consequently, if we place the coil upon the middle part of such a magnet, afterwards withdraw it (the middle part), to a great distance, the conditions of the theory are sensibly enacted. Whence it results that the quantity of the current may serve to measure the total magnetism of the half of a bar, provided that it be not too short; that is to say, its distance should not be less than 8 to 10 centimetres. The current is also independent of the diameter of the coil, on condition that its diameter be a small fraction of the length of the bar."

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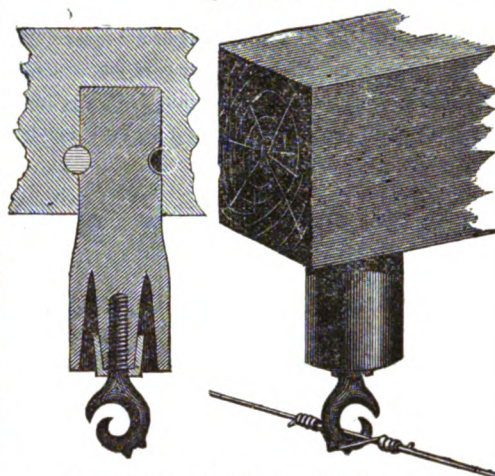
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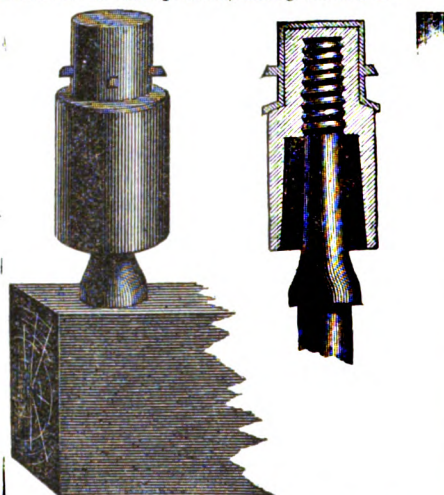
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### CAP INSULATOR, WITH PIN OR BRACKET,

which is fitted with a zinc protection, as shown in the above figure,

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is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

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CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all Insulators furnished by us to prove entirely satisfactory.

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KENOSHA, WIS.

L. G. TILLOTSON & CO.,

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THE WESTERN ELECTRIC MFG. CO., of Chicago,

GENERAL WESTERN AGENTS.

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ESTABLISHED OCTOBER 22, 1867.

Its object is to Aid the Families of Deceased Members

BY PAYMENT TO THE HEIRS OF \$1,000.

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**INITIATION FEE, \$2.00.**

Payments required: One Dollar upon the Death of each Member.

Application blanks, copies of the By-Laws, and other information furnished upon application to the Secretary, or any of the Agents.

The attention of former members of the Association is called to the following resolution, passed at the last Annual Meeting of the Association:

RESOLVED, That delinquent members shall be eligible to renewed membership on payment of back dues to an amount NOT EXCEEDING FIVE DOLLARS, and without further initiation fee.

W. HOLMES, Secretary.

J. D. REID, Treasurer.

Box 3175, New York.

N. B.—Members will please note change in number of Post Office Box.

Photographs and stereoscopic views of the operating room and switch of the New York Office have been taken and will be sold for the benefit of the Telegraphers' Mutual Benefit Association.

### REDUCED PRICES AS FOLLOWS:

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Switch, 8x10.....	.75

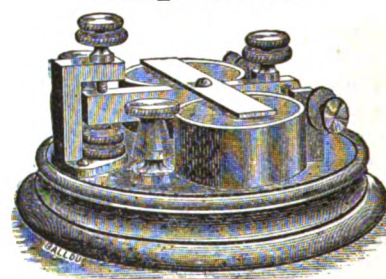
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Switch.....	.35

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No cast or malleable iron used in these instruments.

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TREASURER'S OFFICE,  
New York, July 2d, 1875.

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When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price.  
Price per dozen, - - - - 60 cents.

GEO. H. BLISS & CO.,

CHICAGO, ILL.

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This Company furnish

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To its Subscribers,

By Telegraphic Printing Instruments,

At their respective places of business; and also erect and maintain

PRIVATE TELEGRAPH LINES

For Corporations and individuals, operated with

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As manufacturers of all the perfect TELEGRAPHIC PRINTING INSTRUMENTS in use, and owners of a large number of Patents, we are prepared, under the facilities of our contracts with the WESTERN UNION TELEGRAPH CO., to extend our system of COMMERCIAL REPORTS and PRIVATE LINES to all parts of the UNITED STATES.

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### IMPORTANT NOTICE.

After January 1st, 1875, we allow 20 cents for each used up Porous Cell of this Battery that is returned to us free of charge in good order. A change is made in the discount to the trade.

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## The "Snapper" Sounder.



PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

PRICE 75 CENTS.

Sent post-paid on receipt of price.

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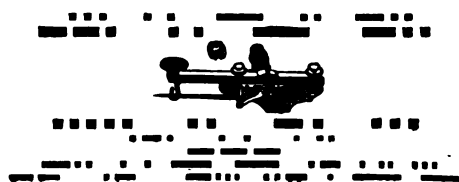
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## AMERICAN LINE.

Weekly Mail Steamship service between  
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Sailing every Thursday from Philadelphia, and  
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The following Steamers are appointed to sail from  
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PRICES OF PASSAGE IN CURRENCY.

Cabin, \$100.

Steerage and intermediate tickets to and from all points at the lowest rates.

Steamers marked with a star do not carry intermediate. Passenger accommodations for all classes unsurpassed.

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Appointed to carry the Belgian and United States Mail.

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For Philadelphia.

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## Orton's Patent Awl Clip.

These Clips have been in practical use for three years, and are rapidly displacing all others.

They are designed for holding messages and every form of blanks.

For convenience, durability and economy they are unsurpassed.

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## Patent Security Message Hook.

The damage resulting from the loss of a single message frequently sufficient to equip a line many times with hook. Papers cannot be blown or carelessly crowded from

These Hooks were first introduced by Geo. H. Bliss & Co.

Thousands of them are in use in telegraph offices, b and counting rooms.

PRICE 30 CENTS EACH, or \$3.00 PER DOZEN.

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**AMERICAN FIRE ALARM.**

AND  
POLICE TELEGRAPH.

GAMEWELL & CO., PROPRIETORS.

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and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

**AUTOMATIC PLAN,**

is now in operation in the following cities, to which reference is made for evidence of its great **SUPERIORITY, VALUE and UNIFORM RELIABILITY**;

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Alleghany, Pa.	New Haven, Conn.
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Baltimore, Md.	Philadelphia, Pa.
Chicago, Ill.	Pittsburg, Pa.
Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass.	Quebec, L. I.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
Dayton, Ohio.	Indianapolis, Ind.
Elizabeth, N. J.	St. Louis, Mo.
Fall River, Mass.	St. John, N. B.
Fitchburg, Mass.	Springfield, Mass.
Hartford, Conn.	San Francisco, Cal.
Jersey City, N. J.	Savannah, Ga.
Louisville, Ky.	Syracuse, N. Y.
Lawrence, Mass.	Troy, N. Y.
Mobile, Ala.	Toledo, Ohio.
Montreal, Canada.	Toronto, Canada.
Milwaukee, Wis.	Washington, D. C.
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Lynn, Mass.	New Bedford, Mass.
Lowell, Mass.	Bridgeport, Conn.

The distinctive features of these systems of

**FIRE ALARM AND POLICE TELEGRAPHS**

ARE

*First*—The **AUTOMATIC SIGNAL BOXES**, the simple electro-mechanism of which enables anyone—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The **AUTOMATIC REPEATER**, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchmen.

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*Fourth*—The **ELECTRO-MECHANICAL GONG STRIKER**, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

*These features combined form the*

**ONLY PERFECT, COMPLETE and RELIABLE SYSTEM**

OF

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Messrs. GAMEWELL & CO. are the owners of the original **FARMER AND CHANNING PATENTS**, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

**MORE THAN TWENTY PATENTS,**

The introduction and operation of the  
**AUTOMATIC SYSTEM**

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

*The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.*

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A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

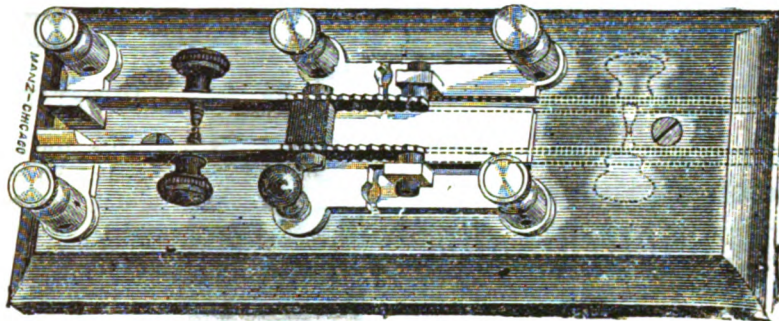
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WE KEEP IN STOCK THE FOLLOWING ARTICLES:

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KERITE WIRE,  
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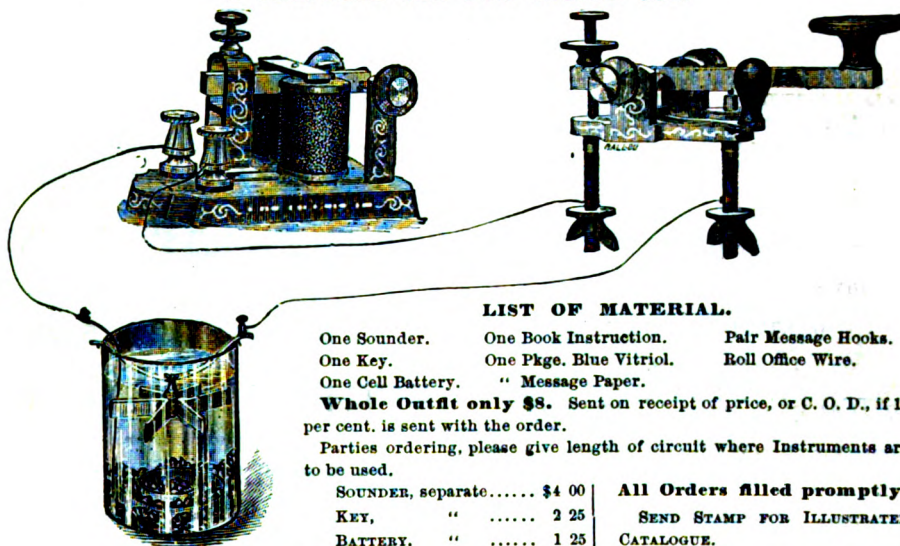
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CUT-OUTS, (new style),

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Our MORSE Instruments are of the Western Union, Ottawa (or Caton) style. We have ample facilities for the execution of every variety of electrical work.

**THE EUREKA INSTRUMENT.**

A COMPLETE SET FOR OFFICE USE.

**LIST OF MATERIAL.**

One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
One Cell Battery.	" Message Paper.	

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SOUNDER, separate.....	\$4 00	<b>All Orders filled promptly.</b> SEND STAMP FOR ILLUSTRATED CATALOGUE.
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**NO OTHER MAIN LINE SOUNDER** has proven as **PERFECT** an INSTRUMENT as that made by us the past two years.

**NO RESISTANCE, EASY ADJUSTMENT AND HANDSOME APPEARANCE COMBINED.**

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Send for Catalogue and Price List.

**SCREW GLASS INSULATORS AND BRACKETS,**

Of the size and thread used by the Western Union Telegraph Company.

Having secured an Exclusive Agency for the Insulators, (manufactured under the Cauvet patent,) we are filling orders promptly for large or small quantities, at prices as low as any Insulator can be sold for in the market.

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SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS,  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
SWITCHES, GALVANOMETERS,  
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A COMPLETE STOCK OF EVERYTHING FOR THE TELE-  
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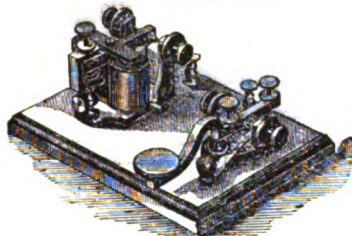
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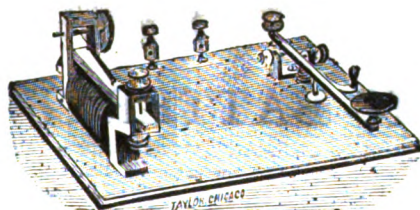
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Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

## THE AMATEUR Telegraph Apparatus

Comprises SOUNDER, KEY CUP OF BATTERY, CHEMI-  
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Several thousand of these instruments already sold,  
They give good satisfaction.

**PRICES:**

AMATEUR OUTFIT, COMPLETE, No. 1, . . .	\$7 50
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" SOUNDER AND KEY, No. 1, . . .	6 50
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" BATTERY, PER CELL, . . .	65

**DISCOUNTS.**

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

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## BUNNELL'S NEW GIANT SOUNDERS PERFECTED.

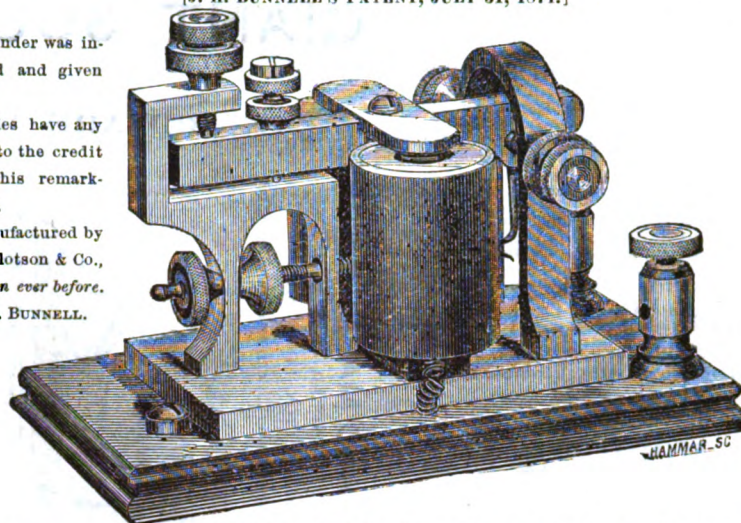
[J. H. BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was in-  
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its name by me.

No other parties have any  
claim whatever to the credit  
of originating this remark-  
able instrument.

It is being manufactured by  
Messrs. L. G. Tillotson & Co.,  
*more perfectly than ever before.*

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable  
and substantial shape.

They give enormous sound with but little Local Battery power.  
Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder  
is desired.

**PRICE, \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

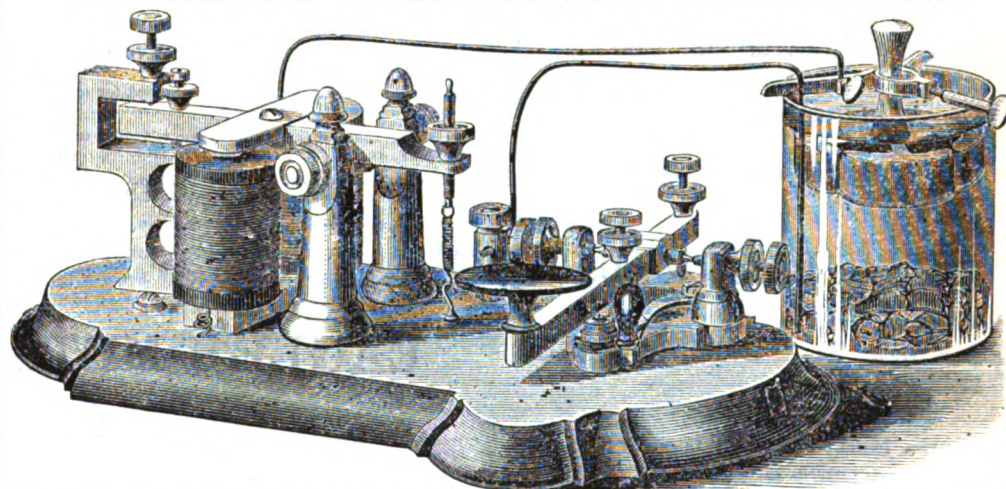
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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

## BUNNELL'S LEARNERS' INSTRUMENT PERFECTED!



Complete and Perfect, full-sized Sounder and Key complete, with  
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[These instruments have been greatly improved in their working qualities and in the style in which they are finished.  
Those having the latest improvement in their construction are those manufactured *only* by Messrs. L. G. TILLOTSON & Co.  
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These Sets are made in the best manner, and are just exactly the thing wanted  
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FOR TELEGRAPH SCHOOLS,

Or FOR SHORT LINES, from a few feet to 12 miles long.

Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials  
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Learners' Instrument, without Battery, &c., . . . 6 50

Ornamental Learners' Instrument, Rubber Covered Coils, &c., . . . 7 50

Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines  
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These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order  
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The undersigned is now preparing to supply the improved and superior

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Favorable arrangements will be made with line constructors, telegraph employes, &c., for the introduction of the Printer. For further particulars, terms, &c., apply to

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Prices always as low as the lowest.

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BRAIDED AND WOUND,

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PARAFFINED OR VARNISHED, COMPRESSED  
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THE ONLY MANUFACTURERS OF THE ORIGINAL

## GIANT SOUNDER, PERFECTED,

Patented February 16, 1875.

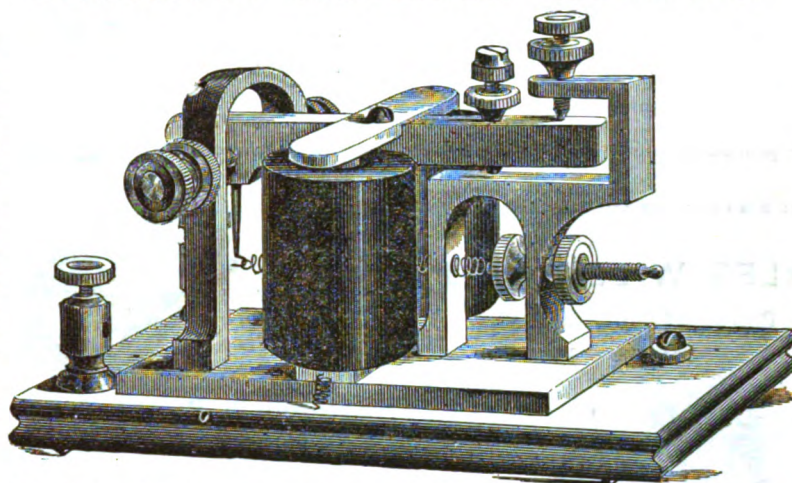
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OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND, SINGLE AND DOUBLE,

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Paraffined or Varnished, Compressed and Polished.



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
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The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every instrument warranted perfect.

**PRICE, sent C.O.D., \$7.50,**

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

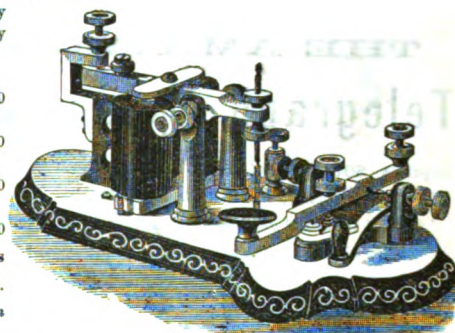
Price of single instrument, good for one mile or less, without Battery, &c. .... \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. .... 7 50

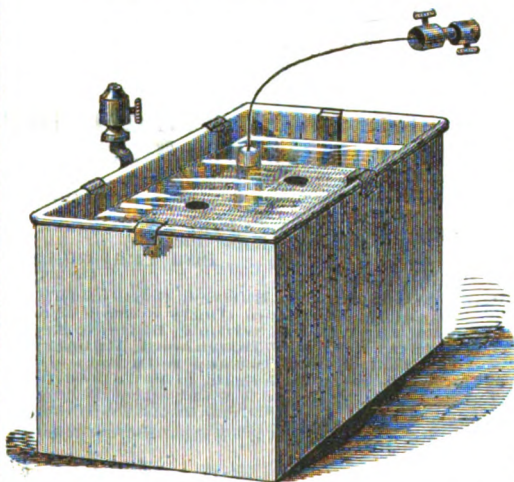
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Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. .... 8 50

This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.



## EAGLE'S METALLIC BATTERY.



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

For OPEN CIRCUITS, where all other gravity batteries are ACKNOWLEDGED FAILURES, the Eagle's Battery is found to be in every respect a PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - - - \$2.25

No. 2, Round " " - - - 2.00

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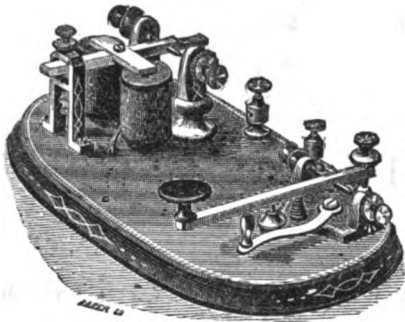
38 South 4th Street, PHILADELPHIA, Pa.



# Western Electric Mfg. Co., CO-OPERATIVE MFG. CO., 218 Pear St., Philadelphia.

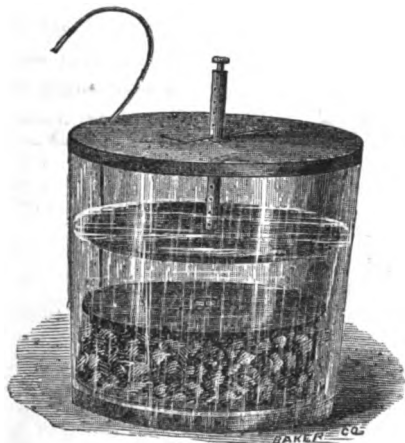
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## Celebrated PRIVATE LINE OUTFIT, THE BEST IN THE MARKET.



### PRIVATE LINE INSTRUMENT.

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on a line from a few feet to ten miles in length.



## BLISS' RESERVOIR BATTERY.

This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

With each "Private Line Outfit" is furnished one Private Line Instrument, one cup of Bliss' Reservoir Battery, the necessary Chemicals, Wire for connections, and a Manual.

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PRIVATE LINE OUTFIT, complete, . . . . .	\$10 00
INSTRUMENT ONLY, . . . . .	8 00
BLISS' RESERVOIR BATTERY, per cell, . . . . .	2 00

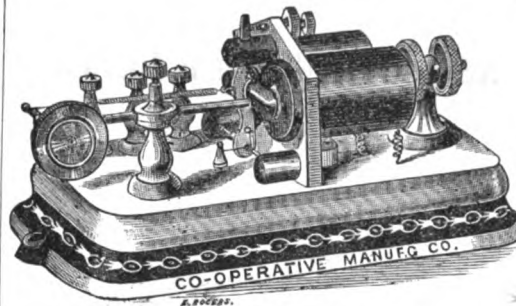
#### DISCOUNTS:

A discount of twenty per cent. will be allowed when remittance is made in advance. Remit by express, registered letter, postal order, or draft.

In ordering, state length of line so that the resistance of instruments may be proportioned accordingly.

Send for Circular. Liberal terms to Agents,

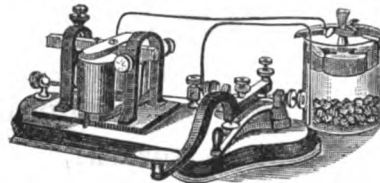
**WESTERN ELECTRIC MFG. CO.,**  
Chicago, Ill.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. It is finely finished.

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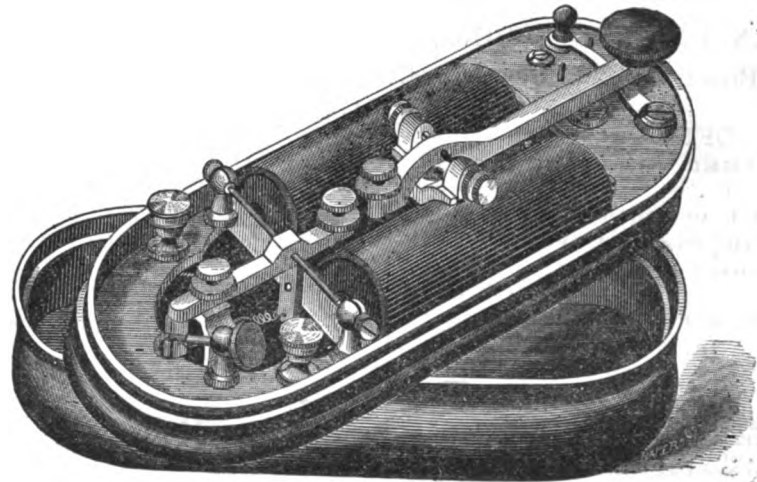
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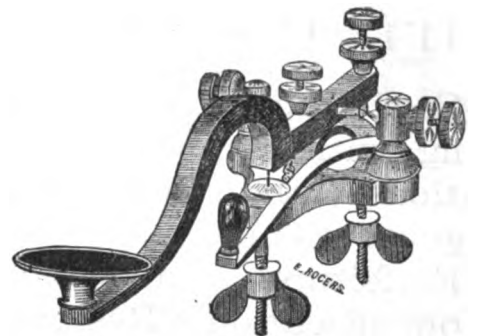
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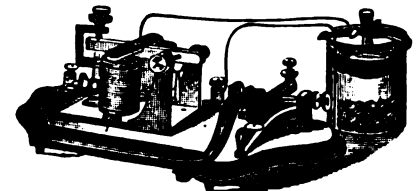
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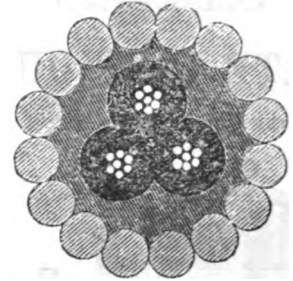
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WHOLE NO. 188.

## THE PHENOMENA OF CHARGE AND DISCHARGE IN TELEGRAPHIC LINES.

If we connect one end of a telegraph line with one pole of a battery and place the other pole of the battery and the other end of the line in connection with the earth, the current pervades the entire line almost instantaneously, reaching the farther end of the line at nearly the same moment that contact is made with the battery. Upon the first appearance of the current at the extreme end of the line, however, it is exceedingly weak, but it constantly increases in strength until it reaches a maximum, which it maintains without further change so long as the connection with the battery continues, and the line is perfectly insulated. If we insert a galvanometer at the distant end of the line, the latter shows no deflection until the current becomes sufficiently strong to influence the needle. The more sensitive the galvanometer is, the sooner it will be affected by the current and the shorter also will be the time that will elapse between the making of the contact with the battery and the perceptible appearance of the current at the distant end. The deflection of the needle continually increases as the strength of current augments, but does not become constant until the current has attained its maximum, which requires a perceptible though very brief interval of time. If we insert several galvanometers at different points upon a long line, and make contact with the battery, the needle of the galvanometer which is nearest the battery will first be deflected, a moment later the second follows, then the third, and finally the one most distant from the battery. In the case of all the galvanometers that are on the half of the line nearest the battery, the angle of deflection increases very rapidly, passing beyond the point at which the needle finally settles, and then again decreases towards that point. It is quite otherwise with the galvanometers that are placed on the second half of the line; their movements, which are feeble at first, continually increase until after a certain time has elapsed, when the galvanometers at the various points all show the same deflection, which continues permanently if the insulation of the line remains constant.

The condition of the line during the time that the strength of current is constantly increasing, that is, from the moment that the line is connected with the battery until the strength of current in all parts of the line is the same, is called the variable state, to distinguish it from the permanent state in which no change of this kind occurs. The permanent state occurs first in the middle of the line, and is attained there four times sooner than at either end.

The time which it takes the current to make itself manifest upon the galvanometer depends upon the sensitiveness of the latter, consequently, neither the instant when the first portion of the current reaches the end of the line, nor the moment when the current begins to be constant, can be exactly determined. Of two galvanometers, the one which is most sensitive is first to show the passage of a cur-

rent. In consequence of this the duration of the variable condition cannot be stated with absolute exactness, and we are obliged to confine ourselves to the determination of the time which is required for the current to reach a state that approximates closely to the permanent state.

### DURATION OF THE VARIABLE STATE.

If we assume with Ohm that electricity flows through a wire in accordance with the same laws that govern the diffusion of heat in a rod which is heated at one end, we are led to the conclusion that the duration of the variable state is in proportion to the square of the length of the line. If for instance a certain line is 2, 3, 4, or more times as long as an-

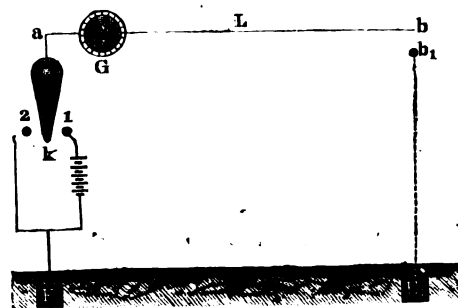


Figure 1.

other, then the duration of the variable state is 4, 9, 16, etc. times as long as it is for the shorter line. Gauguin and Guillemin have experimentally proved the accuracy of this law. The duration of the variable state depends also upon the conductivity, the sectional area and the degree of insulation of the line, and upon the quantity of electricity which is required to produce a certain potential through the unit length of line. With ordinary iron telegraph wire of No. 8 gauge the duration for a length of 300 miles, varies according to atmospheric

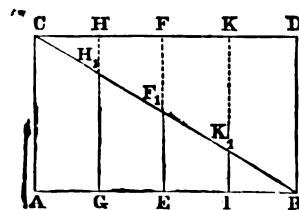


Figure 2.

conditions, between .014 and .022 seconds; on an average it may be said of about .018 seconds. In accordance with the preceding law the time  $t$  of the variable period for a line of 500 miles would then be given by the proportion

$$t_1 : .018 = 1 : (300)^2$$

$$t_1 = .00000162 \text{ second.}$$

We shall hereafter see what influence the other circumstances above mentioned have upon the duration of the variable period.

### CHARGE OF AN INSULATED LAND LINE.

Ohm's laws give no sufficient explanation concern-

ing the manner in which electricity diffuses itself under some conditions. Many phenomena appear upon long telegraph lines which we do not notice upon short ones, and which are entirely distinct from the phenomena of the ordinary galvanic current.

Wheatstone, Guillemin, and especially Gauguin, have very carefully studied the manner in which electricity from a battery is propagated through a long conductor, and we shall therefore state briefly some of the more important results of these examinations.

If, by turning the switch  $k$  on 1 (fig. 1) a wire completely insulated throughout is put in connection with one pole of a battery, the other pole being to earth at  $E$ , we shall find that the galvanometer  $G$  interposed between the wire and the battery indicates a current the moment that the switch is turned on 1. This current, which is powerful in proportion to the length of the line, originates therefore without the existence of a closed circuit, but its full strength lasts only for a very small portion of a second. After the first and almost instantaneous deflection, the needle of the galvanometer again returns to its state of rest, or at most only shows a very small deflection in consequence of the line  $L$  not being perfectly insulated.

As soon as the line wire  $L$  is connected to the pole of the battery, it becomes electrified, and attains throughout its entire length the same potential as the pole of the battery itself possesses; consequently, as the current passes into the wire it manifests its presence first in the neighborhood of the battery. This effect, however, ceases as soon as the charge reaches the extreme end  $b$  of the line, and the line itself attains at all points the same potential as the battery pole. The earth  $E$  with which the other pole of the battery is connected, may be replaced by any other conductor having the same resistance as the line  $L$ .

Although the electrical potential of the battery poles and of the separate parts of the line may not be very high, yet the amount of electricity which flows into the wire may be considerable, as a long line has, in the aggregate, a very large surface; consequently, a considerable amount of electricity, when distributed over the entire surface, would present at any given point of it only an inconsiderable density, and consequently a low potential. A No. 8 wire, such as is ordinarily used for telegraph lines, has a surface of 228.04 square feet per mile, and a No. 6 wire 280.37 square feet per mile, which would give for a line of 500 miles the enormous surface 140,185 square feet.

When the wire  $L$  has attained an equal potential at all points, in consequence of having been connected with the pole of the battery, the wire is said to be statically charged, and the operation is termed charging the wire.

The charge extends only over the surface of the line wire, and its amount is determined both by the magnitude and form of this surface. It is proportional to the length of the line when the latter is so

well insulated that all its parts attain the same potential; it increases also with the volume of the conductor, and is in exact proportion to the electromotive force of the battery.

#### DISCHARGE OF INSULATED LAND LINES.

If we insulate a charged conductor *L* (fig. 1) by removing the switch *k* from 1 and placing it between 1 and 2, thus breaking connection with the battery, its electrical condition will remain unaltered, provided the insulation is perfect. As this is never actually the case in practice, the charge of the line passes off at the points of support and at such other points as derivations may occur. The more defective the insulation is, the sooner will the charge become dissipated.

This flow of electricity from a charged wire takes place with exceeding rapidity on air lines. Even with the best insulated ones it rarely occupies more than a very small fraction of a second. The case is quite different with underground or submarine lines, in which the wire is carefully covered with insulating substances. A tolerably well insulated cable will, according to circumstances, retain its charge so well that even after a lapse of twenty or thirty minutes it will only have lost half of the electricity which it received when being charged.

When, however, after having charged the wire *L*, we separate it from the battery, and then, before any considerable loss of electricity occurs, connect the same end of the wire *a* to the earth *E*, the electricity which at first flowed in, suddenly flows out of the line again, and the inserted galvanometer *G* marks the passage of a momentary current whose direction is opposite to that of the charging current. This may be accomplished in the simplest way by quickly turning the switch *k* on 2, after having placed it on 1 to charge the wire. By this means the end *a* of the wire is separated from the battery and placed in connection with the earth. This second current flowing from the line to the earth is called the discharge or return current.

If, instead of the end *a*, we had connected the end *b* of the line to earth, then the discharge current would have taken place in the direction *a* to *b* and the deflection of the needle of a galvanometer inserted at *b* would have been in a direction opposite to that of the preceding one.

When the line is discharged, the galvanometer needle is also deflected to a certain maximum, and then after several oscillations, finally returns again to its state of rest. As the defective force of the return current acts on the needle in these cases almost instantaneously, the mode of its action upon the needle is similar to that of a blow against a pendulum, that is to say, the defective force, or the magnitude of the discharge, is, in accordance with physical laws, proportional to the sine of half the angle of deflection, and is entirely independent of the kind of galvanometer used.

It is evident that the same law also holds good for the charge, consequently if we indicate the magnitude of the charge by *A*, that of the discharge by *B*, and the corresponding angles of deflection by  $\alpha$  and  $\beta$  respectively, using the same galvanometer for the two deflections, then,

$$A : B = \sin. \frac{\alpha}{2} : \frac{\beta}{2}$$

As the electricity with which the wire is charged becomes gradually dissipated after the charge has been effected, either through the air or by means of other partial conductors, the return current becomes proportionately weaker as a greater length of time elapses between the charging and discharging. If the line were perfectly insulated, and there was,

therefore, no escape of the electricity, or if the discharge could be made to take place simultaneously with the interruption of the battery, the discharge current would be just as strong as the charge current; but as this can in reality never occur, and as some time always elapses between the operations, the discharge current is necessarily always less than the charge current.

The more perfectly a line is insulated the less will be the loss of the electricity with which it is charged, in a given time, consequently, the proportion between the quantity lost and the primitive charge may be made to serve as a means of determining the condition of the insulation.

If we retain the same indications for quantity of charge and discharge as before, and assume that the discharge takes place  $\frac{1}{2}$  second after the charge, then the line in this space of time loses a quantity of electricity *A—B*. The proportion between this loss, caused by derivations or leakages, or, in general, by defective insulation, and the primitive charge, amounts, therefore, for half a second, to *A—B*. The smaller this proportion, the better is the insulation of the line.

On air lines of 5 to 10 miles in length these currents are not perceptible even when using a battery of 300 elements, but with a length of 20 miles both currents are easily rendered apparent by using a powerful battery and a very sensitive galvanometer; when the length exceeds 100 miles even the relay magnets of the telegraph apparatus will show them.

In what has been said it is to be borne in mind that the end *b* of the line *L* (fig. 1) is insulated, while the charging or discharging is done at the end *a*.

#### CHARGING AND DISCHARGING A LAND LINE CONNECTION TO EARTH.

If we put the end *b* of a land line *L* (fig. 1) to earth by connecting *b* with *b<sub>1</sub>* and earth plate *E<sub>1</sub>*, a constant current, as we know, traverses the line as soon as the battery is connected. This current is indicated by a permanent deflection of the galvanometer needle and lasts as long as the battery remains in circuit. In this case the electric potential at each point of the line is not equally great, but decreases continually throughout from the pole 1 to the extreme end *b<sub>1</sub>* and *E<sub>1</sub>*. Owing to this decrease of potential from point to point, a constant flow of electricity from the battery through the line to the earth *E* takes place if the potential at *b* is the same as at 1 and at *a*, then there will be no flow of electricity from 1 to *a* and *b*. The wire *L* even in this case becomes charged with electricity, but the amount of the charge is smaller than when the end *b* is insulated, while in the latter case the potential is the same at all points.

Blavier very properly compares both the charging and discharging of a line, when the distant end is insulated and uninsulated, with the movement of a gas through a tube, one of the ends of which communicates with a very large reservoir, in which the gas is under a constant pressure, the other end being placed in a vacuum.

If we interrupt the connection with the vacuum and close the opening of the tube at this end, the gas flows into the tube only so long as the pressure is not the same at all points.

This is precisely the case with a telegraph line when one end is insulated. The reservoir represents the battery, the tube the wire, and the gas the electricity.\*

\* The comparison, however, is not exact, since in charging the wire with electricity we need not suppose a real propagation of the electrical fluid from one point to another, but should rather consider it to be the result of a progressive decomposition and recombination of the natural electricity.

When, on the contrary, the end of the tube is placed in the vacuum, and the gas is allowed to flow through it, then the pressure in the immediate neighborhood of the reservoir is equal to the pressure of the gas in the reservoir itself, and it decreases gradually to the end of the tube where it becomes zero. Consequently the total amount of gas in such a tube is less than in the former case, when the tube is closed at the end.

We may obtain a good idea of the condition of the static charge in a line insulated at the remote end, and of one having the remote end connected to earth, if we suppose the electric potential of the separate points to be represented by vertical lines which are erected at the respective points.

Let *AB* (fig. 2) be the length of the line; suppose it to be connected to one pole of the battery at *A*, and let the potential at this pole be represented by the vertical line *AC* erected at *A*. If the extreme end *B* of the line is now insulated, by which the potential at all points of the line becomes equal to *AC*, then the vertical lines *GH*, *EF*, *IK*, *BD*, which are each equal to *AC*, represent the potential at the points *A*, *G*, *E*, *I*, *B*. The total charge of the line is, therefore, the sum of all the perpendiculars of the length *AC*, which it is possible to conceive of as existing between *A* and *B*; that is to say, it is proportional to the contents of the rectangle *ACDB*.

When, on the contrary, the end *B* is connected to earth, then the electric potential from *A* towards *B* decreases in proportion to the distances taken, if we still represent it at *A* by *AC*, then for the distances *AG* =  $\frac{1}{2}$  *AB*, *AE* =  $\frac{1}{3}$  *AB*, *AI* =  $\frac{2}{3}$  *AB*, it will be respectively  $\frac{1}{2}$  *AC*,  $\frac{1}{3}$  *AC*,  $\frac{2}{3}$  *AC*, and at the point *B* it falls to zero. Consequently, if we draw the line *CB*, the verticals *GH<sub>1</sub>*, *EF<sub>1</sub>*, *IK<sub>1</sub>* will represent the charges corresponding to the points *G*, *E*, *I*. The total charge of the line *AB* is, therefore, equal to the sum of all the verticals included between *AB* and *CB*. Consequently, it is proportional to the area of the triangle *ACB*.

It follows, then, that the total charge of a line whose distant end is connected to earth, is only half as great as when the line is completely insulated.

#### RETURN CURRENT IN LAND LINES WHEN PUT TO EARTH.

When the line *L* (fig. 1) is in contact with earth *E<sub>1</sub>* at the point *b*, and the switch *k* is turned on 1, then *L* receives a charge half as great as if *b* were insulated. If now the connection between the line and battery is broken, the electricity which is distributed on the line rapidly escapes through *b* to the earth *E<sub>1</sub>*. For this reason, the duration of the discharge for ordinary land lines is exceedingly short, at any rate, very much shorter than when the line is insulated at *b*, in which case the discharge can only be effected through the air and by the poles, so long *k* remains between 1 and 2.

When, however, the line is very long, for instance 100 miles or more, the discharge does not take place in an immeasurably short period of time.

If we turn the switch very quickly from its position 1 to 2, then the discharge takes place in two opposite directions; the greater part of the charge in the vicinity of the battery passes over *k* and 2 to earth *E*, producing the return current, whose direction is opposite to the direction of the charge; the other and smaller part flows in the direction of the charge (from *a* to *b*), through *b* to earth *E<sub>1</sub>*. The return current may be observed on a sensitive galvanometer *G*.

The discharge may also be delayed and made apparent on a line without insulating its end *b*, by inserting a considerable resistance between *b* and the earth *E<sub>1</sub>*.

As this opposes to a considerable extent the flow

of electricity at *b*, the return current at *a* will be much stronger when the switch *k* is quickly turned from 1 to 2.

The same effect takes place when, instead on an artificial resistance at *b*, a considerable resistance is accidentally present in the line itself, such for instance as may occur in consequence of defective wire connections or bad connections in the instruments. This fact often enables us to form a conclusion from the appearance of the return current, whether there is a defect at the other end of the line.

We must not however, confound the return current with the so-called extra current, which originates at the moment the battery is placed in circuit, and also opposes the main current, this extra current occurs only at the moment that the battery is closed while the extra current which appears at the interruption of the battery, has the same direction as the main current in the line.

On breaking battery connection by turning the switch *k* (fig. 1), from 1 to 2 quickly, there results, especially in very dry weather and upon long lines, say of at least 250 miles in length, an extra current as well as a return current. These are, however, of opposite direction; the return current being opposite to that of the battery current, while the extra current (opening), is in the same direction as the battery current. By means of a very sensitive galvanometer we may therefore see which of the two is the strongest.

On very short lines the extra current which appears when the battery is interrupted and whose direction is the same as the line current, is the most powerful, that is to say, the extra current is more powerful the shorter the line is, while the return current may not be perceptible at all.

If the length of the line is increased and the battery suddenly disconnected, by turning the switch *k* from 1 to 2, the return current makes its appearance, and is distinguished from the extra current by its direction. It increases also, in the same proportion that the length of the line is increased.

Both currents may be recognized when the battery is suddenly interrupted and the line connected to the ground, with the ordinary Morse duplex apparatus, by the attraction of the armature levers. With the step-by-step printing instruments both currents are increased when the line is more than 100 miles long and the transmitter makes from 10 to 12 pulsations per second.

#### ELECTRIC FALL MACHINES.

These are for demonstrating the laws of falling bodies. In one arrangement a brass ball is hung by a thread some height above the ground. Under it, at distance = 1, are two metallic balls connected with the poles of an electric machine; they are so far apart that a spark cannot pass between them, but if the suspended ball drop between them a spark will pass. Further down, at distance = 4, then = 9, etc., are similar pairs of balls. The thread of the suspended ball being burnt, the latter falls between the successive pairs, giving passage at each pair to the current, and simultaneously the spark in another part of the circuit strikes a revolving soot-blackened drum, making a mark. The distance between successive marks are found to be equal. In a second arrangement, there are two cylindrical conductors, insulated and vertical, with a metallic ball suspended between them at the top, hardly filling the interval, and sufficient to enable a spark to pass between the cylinders, which are connected with the poles of an induction (secondary) coil. One of the cylinders has a coating of soot-blackened paper. The thread is burnt, and the ball falls; sparks are made to pass

at regular intervals of time, by means of clockwork, interrupting the battery current. Each spark leaves its mark on the blackened surface; and thus are shown the spaces passed over in equal times.—*M. Walther.*

#### A METHOD OF MEASURING ELECTRICAL RESISTANCE OF LIQUIDS.

At the last meeting of the London Physical Society Mr. W. J. Wilson read a paper on "A Method of Measuring Electrical Resistance of Liquids." Great difficulty has hitherto been experienced in measuring the resistance of electrolytes on account of the polarisation of the electrodes, and most of the methods hitherto employed have aimed at reducing this to a minimum by using large electrodes and very weak or rapidly alternating currents. The determinations, however, are difficult and require to be quickly performed. The following method is easy and is free from both the above objections. The arrangement in its most simple form consists of a long, narrow trough filled with the liquid to be measured, say diluted acid. A porous pot containing a zinc plate in sulphate of zinc being placed in the acid at one end of the trough, and a similar pot with a copper plate in sulphate of copper in the acid at the other end; the whole arrangement forms a sort of elongated Daniell's cell, the chief resistance of which is in the long column of acid. The circuit between the plates being completed through a resistance-box and mirror galvanometer, the current is shunted until a suitable deflection is obtained. One of the porous pots is now moved along the trough towards the other, and, as the resistance of the circuit is thus reduced by shortening the column of acid, the galvanometer deflection largely increases. The external resistance is now increased by means of the box until the deflection is reduced to the same point as at first. This resistance put into the circuit is evidently equal to that of the liquid taken out, and thus a measure of the liquid resistance is obtained. Two forms of apparatus were shown. In one, the vessels, containing sulphate of zinc and sulphate of copper respectively, formed pistons in a glass tube which contained the liquid to be examined. In the other, two pairs of concentric vessels were connected by a bent glass tube which contained the liquid under examination. The method is applicable to a great variety of liquids, and with care almost any degree of accuracy may be obtained. The chief obstacle to exact measurements lies in the fact that the resistance of liquids is greatly affected by temperature, but this difficulty is, of course, common to all methods. Mr. Wilson has been experimenting with brine and gave some of the results obtained, but he has not as yet made a sufficient number of experiments to complete a table. A mode of arranging the apparatus in a differential or bridge form was also described, but it has not been found necessary to use it; the simple circuit arrangement giving accurate results with less trouble.

Prof. Foster asked whether experiments had been made in order to compare this method with Wheatstone's, which differed from Mr. Wilson's as liquid electrodes were not used. He then described an arrangement he had adopted for measuring the polarisation of plates in a voltameter.

Prof. McLeod stated that he had used plates of amalgamated zinc and reversed currents to overcome polarisation. He found that some salts, chloride of zinc for instance, had points of maximum conductivity which corresponded to a definite degree of concentration.

Prof. Guthrie considered the research to be interesting as showing that points of minimum resistance might coincide with points of definite hydration of the salts.

Mr. Wilson, replying to Prof. Foster, stated that the chief objection to the use of metal plates is not a variation of the electromotive force of polarisation, but is due to the accumulation of bubbles of gas on the metallic surfaces.

#### FREAKS OF LIGHTNING IN ITALY.

*Correspondence of the London Echo.*

Rome, July 12.—Padre Secchi publishes an account of the singular phenomenon which occurred at Velletri during the violent thunder-storm of June 28, and which is to be ranked among the hitherto unexplained caprices of nature. Just as the tempest was at its height, and the rain torrential, six persons taking shelter in a stable, which was also occupied by three horses harnessed to as many wine-carts, witnessed the extraordinary appearance. A luminous mass rose from the threshold of the door, entered the stable, glided from one cart to another, attracted, probably, by those fringes of bells characteristic of the Roman wine-carts, and then passed through an iron grating into the street. The bells rang, the horses plunged, a woman and a man felt a certain giddiness of head; but no accident happened. Outside the stable, a carpenter at his shop-door saw the luminous mass (which some of the witnesses compared to a fiery club as thick as a man's arm) issue from the grating, the pavement, and disappear in a dazzling flash. However, the meteor visited several portions of the large house with which the stable was connected, flew through large chambers, blackening slightly a gilt cornice in one, and scattering fragments of plaster in another. Strangest of all, this extraordinary visitor, after completely destroying the new ceiling of a room leading into a vast kitchen, danced round a woman who was standing at a table. She described the meteor as a fiery serpent, which she first saw standing upright on the floor, within two metres' distance of her. Then it flew toward her whirling several times around her knees with great velocity. She felt a sudden blow on the head and fell to the ground; but her husband, who saw the whole apparition, on rushing to what he supposed was the corpse of his lightning-destroyed wife, found that she was only stunned a little. On recovering, she complained of pain in the scalp, and her hair had become and remains, dry and rigid. After this last caprice the meteor disappeared, and from the quantity of soot which fell from the chimney, it is supposed to have found vent in that direction. It was accompanied by a loud detonation, but whether on its first appearance, or when it vanished, none can say. These details are gathered from a letter written to Padre Secchi from the Meteorological Observatory at Velletri, and published in the *Voca della Verità* of July 9. After this one may believe that Tanquil really did see a "lambent flame" play around the head of Servius Tullus in his cradle; nor can the tale of the stars playing on the River Moldau at Prigue over the body of St. Jean Nepomuc be so certainly set down as a pious fancy of the Middle Ages, unsupported by natural phenomena.

Professor Cornu, of the *Ecole Polytechnique*, Paris, has put into successful use a new instrument for measuring the velocity of light, between two stations, in which an electrical registering apparatus is used, giving, it is believed, more accurate measurements than the well known toothed wheel arrangement of Fizeau. Foucault fixed the velocity of light, by his instrument, at 185,157 miles per second. Professor Cornu, by his new instrument, fixes the velocity of light at 186,600 miles per second, 1,503 miles faster per second than Foucault.



NOTES OF A COURSE OF SEVEN LECTURES ON  
ELECTRICITY.

BY PROFESSOR TYNDALL, LL.D., F.R.S.

(Continued from page 229.)

[From the Telegraphic Journal.]

## NOTES OF LECTURE IV—February 25, 1875.

1. In Experiment (9), Lecture III., it is said that if you touch the sphere under induction "anywhere," the repelled electricity will be discharged. This is readily proved by means of the single sphere employed in (9).

2. It is still more strikingly proved by two spheres mounted on insulated stands—say warm tumblers—and connected by a chain. Bring excited glass jar or tube near one of the spheres; the distant sphere is instantly charged with positive, the adjacent sphere with negative, electricity. A carrier which has touched either ball attracts lath. Touching distant ball it repels rubbed glass; touching adjacent ball it repels rubbed gutta-percha.

3. If the distant ball be touched with the finger, its electricity, as might be expected, flows away to the earth. But the same occurs when the *adjacent* ball is touched. In all cases the *repelled* electricity—and it only—is free; and no matter what part of the system under induction is touched, the free electricity—and it only—passes to the earth.

4. The induced electricity of both balls may be shown by means of the straw electroscope referred to in Experiment (10), Lecture II. The short arm of the straw being brought within 4 or 5 inches of one of the balls, the straw is positively electrified. On placing the excited glass tube which has electrified the straw near the other sphere, the index immediately shows repulsion. Touching one of the spheres, or the connecting chain, with the finger, the free electricity—and with it the repulsion—vanishes. On removing the glass tube the liberated negative electricity produces prompt attraction.

5. The prime conductor of the electric machine is charged by induction. When the glass quits the cushion it is positively electrified. A series of points which forms part of the conductor is commonly presented to the glass. From these the negative electricity streams against the excited glass, and neutralises it. The prime conductor thus becomes charged, not by the accession of positive electricity, but by the withdrawal of negative electricity.

6. The charging of the Leyden jar implies induction. The outer coating being connected with the earth, and the inner coating with the electric machine, the electricity poured into the jar acts inductively across the glass upon the outer coating, attracting the opposite electricity and repelling that of the same name to the earth. Two oppositely electrified layers are thus in presence of each other, being separated merely by the glass. On bringing the inner and outer coatings, by means of a discharger, near each other, before contact is established, discharge occurs in the form of a spark.

7. In the first form of the Leyden jar the hand of the operator formed the outer coating, and the water the inner coating.

8. Instead of glass we may employ any other insulator. Dry air may be employed. Two plates of brass—the one insulated, the other not, with a layer of air between them—constitute a virtual Leyden jar. The arrangement, however, has a name of its own—the condenser.

9. In charging the prime conductor of the electric machine, the charge on the conductor continues to augment up to a certain point, after which it is not augmented by the further working of the machine. If the electricity be drawn away from the conductor,

and stored up in a Leyden jar, it requires a greater amount of turning to reach the stationary point. This withdrawal of the electricity by the attraction of a layer opposite the electricity is well shown by the condenser.

10. The nearer the two plates of the condenser are to each other the more complete is the withdrawal, and the thinner the glass of a Leyden jar the more complete is the withdrawal. The force of "condensation" in the Leyden jar was proved by Wilson and Cavendish to be nearly in the inverse ratio of the thickness of the glass.

11. The Leyden jar is sometimes perforated by the discharge of the electricity through the glass. A certain thickness of glass is necessary to prevent this.

12. The influence of the oppositely attractive coating may be well shown by laying a sheet of tinfoil on a table, a plate of glass on a sheet of tinfoil, and a second sheet of tinfoil upon the glass. All being loose, let the upper sheet of foil be connected with a gold-leaf electroscope, and with an electrical machine; turn the machine carefully till the leaves show signs of divergence; then lift the glass and upper coating by means of silk loops. Removed from the condensing action of the lower sheet of foil, the electricity of the upper one diffuses itself so strongly over the electroscope that if care be not taken the ruin of the instrument will be the consequence.

13. Sheets of common block-tin, sheets of paper unwaxed, or plates of undried wood, may be employed in the last experiment, instead of the sheets of tinfoil. With the principle of induction for our guide, we can illustrate in various ways the action of the condenser and of the Leyden jar.

14. Canton found that an amalgam of mercury and tin, mixed with a little chalk or whiting, and applied to the rubber or cushion of the electrical machine greatly augmented the amount of electricity generated. He was led to this discovery by his experiments on the friction of bodies in pure mercury. The amalgam applied to our cushions is formed of 1 part of tin, 2 parts of zinc, and 6 of mercury, rubbed well together in mortar, and applied to a cushion of rubber on which a little hard has been smeared. The friction of this amalgam against glass always yields positive electricity, whereas the quality of the electricity excited by other rubbers depends—as shown by Canton—in some measure on the condition of the vitreous surface.

15. The action of the *electrophorus*, introduced by Volta in 1775, is also clearly explained by the principle of induction. The flat surface of an insulator is excited by friction. A flat conductor with an insulating handle is brought down upon the excited surface, which acts inductively upon the conductor. Touch the latter, its repelled electricity passes to the earth. Lift the conductor; it is now charged with electricity opposite in kind to that of the insulator. The process of charging and re-charging the cover of the electrophorus may be repeated a great number of times.

The following memoranda connect themselves with those on the distribution of electricity (25 to 29, and 37 to 42) of our last lecture:—

16. Monnier proved that the charge of a conductor depended on its surface, and not upon its solid contents. An anvil weighing 200 lbs. gave a smaller spark than a speaking trumpet weighing 10 lbs. A solid ball of lead gave a spark of the same force as that obtained from a piece of thin lead of the same superficies, bent into the form of a hoop. Finally he obtained a strong spark from a long strip of sheet lead, but a very small one when it was rolled into a lump.

17. Le Roi and D'Arcy showed that a hollow sphere

accepted the same charge when empty as when filled with mercury, which augmented its weight sixty-fold. All this proves the influence of *surface* as distinguished from that of *mass*.

18. The distribution of electricity is well illustrated by the deportment of hollow bodies. In part successive measures of electricity to the interior of an ice-pail, or a pewter pot. On testing the interior of the vessel with a carrier no electricity is found there, but it is found on the external surface. A hat suspended by silk strings answers as well as the ice-pail.

19. The successive charges may be communicated by a metal ball suspended by silk. The charged ball, on touching the interior surface, becomes, as shown by Franklin, completely unelectric. In making the experiment with the hat, note that the electricity is feeble on the round surface of the hat, but dense at its edges and corners.

20. Franklin placed a long chain in a silver tea-pot, with a silk string at one end. Connecting his tea-pot with a pith-ball electroscope, he produced a divergence. Then lifting the chain by the silk he found that over the portion outside the tea-pot the electricity was diffused, this withdrawal of the electricity from the electroscope being announced by the partial collapse of the divergent pith-balls.

21. The greatest experiment of this kind was made by Faraday, who placed himself in a cubical chamber built of lath and covered with paper and wire-gauze. It was suspended by silk ropes. Within this chamber he could not detect the slightest sign of electricity, however delicate his electroscope, and however strongly the sides of the chamber might be electrified.

## EXPERIMENTS IN LECTURE IV.

(1.) Two insulated balls, 6 feet apart, united by a chain. Rubbed glass jar placed near one of them, that one found charged with negative, and the distant one with positive electricity.

(2.) Touch distant ball, the positive electricity escapes. Touch near ball, the positive fluid equally escapes, flowing, as it were, *through the caprice negative electricity* to the earth. Jar removed; negative electricity found afterwards diffused over both balls and chain.

(3.) Distribution of electricity on cone; charge taken by carrier from rounded apex of cone when tested by electroscope obviously stronger than charge taken from rounded base.

(4.) A brass cylinder (wood covered with tinfoil would answer equally well) presents a point at one of its ends to the prime conductor of the electrical machine. Working the machine and discharging the prime conductor, the cylinder is found charged with positive electricity.

(5.) Turning the end with the point from the prime conductor and working the machine the cylinder is found charged with negative electricity. In the first of those cases the negative electricity was drawn from the point to the positive electrified prime conductor; in the second case the positive electricity was driven from the point into the air.

Remark.—The mode of charging the prime conductor described in Note 5, Lecture IV., is illustrated by the first of these experiments.

(6.) Standing on insulated stool, with left hand connected with prime conductor, and sewing needle in right hand, covering the point of the needle with the finger, on presenting hand to electroscope (4 or 5 feet distant) a very slight action is observed; uncovering the point, the leaves fly violently asunder.

(7.) Mounting a tassel formed of strips of tissue paper on conductor, on turning the machine, the strips diverge by mutual repulsion. If the needle

with its point covered be presented to the tassel, attraction follows; but the moment the point is uncovered the strips shrink together, and the entire tassel retreats from the point. This illustrates the action of a pointed lightning conductor on an electrified cloud.

(8.) Closing the hand loosely over the needle, long sparks are drawn by the hand from the electrical machine. Causing the point to protrude from the hollow of the hand, no sparks are possible. The broad knuckle or back of the hand, and the finger end, show a similar difference. Presenting the former to the conductor we have dense long sparks; presenting the latter, hardly any sparks at all.

(9.) Take successive measures with a carrier ball (held by a silk string) from primo conductor, or from rubbed glass tube, and put them into an insulated ice-pail, a tankard, or a hat. No electricity is found within any of them; but it is found on the external surface of each, from which it may be communicated by a carrier to the electroscope. A mouse within a wire-gauze cage could not be affected by the strongest charge imparted to the cage.

(10.) Franklin's experiment, Note 20, Lecture IV., was made with a small tea-pot and a chain, quadrupled so as to obtain a greater amount of surface. On lifting the chain the gold leaves of the electroscope closed up, on lowering the chain they opened out.

(11.) Cake of resin electrified by fox's brush. Plate of brass with insulated handle placed on the resin. The brass was touched, and the plate lifted. The spark from it ignited a jet of gas.

(12.) A circle of sheet zinc (cut by a pair of common scissors), with a stick of sealing-wax for a handle, makes a very effective electrophorus. Striking a piece of vulcanised india-rubber with fur, and placing the zinc upon it,—on touching the zinc and then lifting it, it is found strongly charged. A half-crown with sealing-wax handle treated in this way energetically attracts a large balanced lath.

(13.) In all cases the resinous plate, whether it be of ordinary resin, shellac, vulcanised india-rubber, or ebonite, proves its electricity to be negative by strongly repelling a rubbed gutta-percha tube. The metal plates, on the contrary, prove their electricity to be positive by forcibly repelling a rubbed glass tube.

#### THE FIRST OVERLAND TELEGRAPH IN CHINA.

The *Pail Mall Gazette* says: The construction of the first overland telegraph in China has been attended with considerable difficulties. It was when the Formosan affair became threatening that the Viceroy of Fuhkien made arrangements with the Great Northern Telegraph Company for the construction of a line from Amoy to his Yamun at Fuhchow. But no sooner was the first portion completed than the natives discovered that the erection of the poles interfered with the benign influence of the Fung-shin of the district. They therefore turned out "in their thousands" and uprooted the poles. Upon this the company appealed to the native authorities for protection, and ultimately the matter was referred to Prince Kung and the foreign Ministers at Peking. The result of this diplomatic interference has been that a new contract has been made with the Great Northern Telegraph Company, under the terms of which the Viceroy agrees to pay the company \$154,500, or upwards of £30,000, for the construction of the line between Amoy and Fuhchow, a distance of about 160 miles, and a further annual sum of \$30,000 for its maintenance. We imagine that the company can

have nothing to complain of in these terms. The Mandarins further bind themselves to give full protection to the company's staff and material, and to be responsible for any theft that may be committed on the property of the company, or for any delay that may be occasioned by unlawful interference on the part of the natives. The company, on their part, agree to make and to keep in repair the line, and to instruct Chinese pupils appointed by the Government in the art of telegraphy.

#### THE TELEGRAPH IN SENEGAL.

The Senegal service comprises three lines—the first going from St. Louis to Dakar, the second from St. Louis to Dagana, and the third from St. Louis to the Bar (Mouth of the Senegal).

*Dakar Line.*—This line is the most important; it is 126 miles in length; its direction is from N. to S. W.; it is constructed with a single wire of 3 m.m. It connects six offices—St. Louis, Gandiole, Betete, Mbidjem, Rufisque and Dakar. The region it traverses is for the most part uncultivated, without any road, intersected by large and deep morasses, slightly undulating, with impenetrable thickets of palms and bushes of different kinds scattered over it. From Gandiole to Mbidjem the country is no longer under the dominion of the French; it was given back in 1870 to a native chief, on the sole condition that he would respect the telegraph line and the station of Betete, placed in the heart of his territory. The staff employed at each of these stations is as follows: At St. Louis, the director of the service, an employé of the fifth class on the metropolitan list, a native assistant, a supernumerary, a superintending chief, and two native superintendents; at Gandiole, a military employé and two superintendents; at Betete, a military employé and two superintendents; at Mbidjem, a military employé and two superintendents; at Rufisque, a military employé and one superintendent; at Dakar, an employé of the fourth class on the metropolitan list, a head of the office, a military employé, a supernumerary, and two superintendants; total, 23 employés.

*Dagana Line.*—This unites with St. Louis by an important station in a commercial point of view, placed on the River Senegal: its length is 77 miles, and its direction from W. to N. E. This line serves four offices:—St. Louis, Lampsar, Richard-Toll, and Dagana. The office at Lampsar is closed for the time being. The country traversed by this line is under French rule, it is often inundated during the winter season by the swelling of the river. At Lampsar resides a superintendant; at Richard-Toll, a civil employé and a superintendent; at Dagana, a civil employé and two superintendents; total, 6 employés.

*The Bar Line.*—The length is nearly seven miles. It traverses a region intersected by morasses, and by the tributaries of the river; its direction is from N. to S. It unites to St. Louis the pilot station placed at the mouth of the Senegal. A civil employé has charge of the office.

*Staff.*—These nine offices are supplied with the following staff—A head clerk from the Metropolitan Administration, director of the service (M. de Chauvillain); two employés from the Metropolitan Administration, one of whom is at St. Louis (M. Sainte-Marie Priet), and the other at Dakar (M. Flusin); four employés of the fifth class, natives; seven military employés; a chief superintendent and fifteen native superintendents. The native employés are recruited by means of examinations. The military employés are put, by the marine infantry, at the disposal of the telegraphic service; they receive instruction at St. Louis and Dakar, and they are then sent to the interior stations. The native superintendents form a very good staff, many of them having been in

the service since its organization, twelve years ago; they are well up in their duties, thoroughly disciplined, and capable of bearing the fatigues and privations of a journey on foot in this unhealthy climate.

*Interior Service.*—The offices are open every day from 7 to 10 o'clock in the morning, and from 2 to 6 o'clock in the evening. The offices at Lampsar and Richard-Toll were closed in 1873.

*Tariffs.*—Between any two stations 2 francs for twenty words; 0.50 fr. more for each fraction of five words. Between St. Louis and La Barre, 0.50 fr. for ten words; 0.05 fr. for each additional word.

	Francs.
The amount received for private dispatches amounts to.....	9,925.85
The transmission of official dispatches corresponds to a sum of.....	13,492.00
Total.....	23,417.85

The total number of messages transmitted during 1873 was 8,531.

The stations Gandiole, Betete and Mbidjem, being distant from any centre inhabited by Europeans, have only very few messages.

*Surveillance of the Line.*—This service is very trying, especially during the winter season; the torrents of rain and the violent tempests overthrow the poles and break the insulators. Notwithstanding these difficulties, only three days' interruption have taken place during the year. The materials, including the poles, are carried on the backs of mules. Nearly all the disarrangements are caused by the fall of the poles, which the sandy soil will not retain firmly; there is no stone in the interior of the country to consolidate them, and the wooden *traverses* are soon rotted or nibbled by Termites; fortunately, however, they do not attack the injected poles. Many poles are also destroyed by the fire which the natives set to the rank grass to clear their fields. The thunder storms, notwithstanding their great electrical intensity, lead to no durable perturbation over the lines and in the apparatus. As to the disarrangements caused by malevolence, these are excessively rare. The blacks, very superstitious, fear to touch the line; they believe generally that it serves only to indicate to Europeans the road to follow in going from Dakar to St. Louis.

#### INDUCTION COILS.

The largest induction coil yet made is that of the Royal Polytechnic Institute, of London. The length of this coil is 9 feet 10 inches, diameter 2 feet, weight 15 cwt., including 477 lbs. of hard rubber. The core is 5 feet long, and four inches in diameter, of No. 16 iron wire. The primary coil consists of 145 lbs. = 3,770 yards, of No. 13 wire. The secondary coil consists of 150 miles of wire, weighing 606 lbs., and having a resistance of 33,560 ohms. The condenser is in six parts, each containing 125 square feet of tin foil. With five large Bunsen cells, the spark is 12 inches in length, and with 50 cells this has been increased to 29 inches.

The induction coil constructed by Ritchie, for the Stevens Institute of Technology, at Hoboken, N. J., has a primary coil consisting of 195 feet of No. 6 wire. The secondary coil is over 50 miles in length, of No. 36 wire. The core is composed of a bundle of No. 20 iron wires, wrapped in oil silk and cloth. With three large bichromate cells, this coil has given sparks 21 inches in length, capable of piercing through solid glass three inches in thickness.

The Indo-European Telegraph Company announces that the average time in transit between London and India of all outward messages to India and beyond, during the week ending July 9th, *via* Teheran, was 1 hour 31 minutes.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, September 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Canterbury, Del. (office reopened in last JOURNAL) is in square 60.

Emory Grove Camp, Md., closed.

Messages taken for the following places in Mass., will be delivered from East Saugus. Charges for delivery given herewith:

Saugus Centre (Village), Mass.,	\$0.50.
North Saugus, "	1.50.
Cliftondale, "	0.75.
Oaklandvale, "	1.75.

Hereafter the "tariff for other lines" from Brownsville, Texas, to Tampico, Mex., will be 425 and 40.

Buttonville, Mich., changed to North Bradley.

Barnaby's River, N. B. (reopened in last JOURNAL), is an office of the Montreal Telegraph Company. Tariff for other lines 30 and 2 from Sackville.

Harlingen, N. J., closed.

Hillsboro', N. J., closed.

The P. O. Address of Stitts, N. J., is Franklin, Essex Co.

Messages taken for the following points in N. J., will be delivered from Newark. Charges for delivery as given herewith:

Belleville, 50 cents.
Irvington, 50 "
Woodside, 35 "

On and after September 1, 1875, Newfoundland and St. Pierre, M. I., messages will be checked to North Sydney, C. B. I., instead of Port Hastings as heretofore.

Pine Valley, N. Y., an office on other lines named in the tariff book, is in Chemung Co.

Markhams, N. Y., closed.

Kilbride, Ont., closed.

Manorville, Pa., closed. Messages for Manorville will now be delivered from Kittanning. Charges for delivery 50 cents.

Messages taken for Dull's Quarry, Pa., are delivered from Kittanning. Charges for delivery 50 cents.

Angora, Pa., reopened as a W. U. office, square 59. Check direct.

Sterling, Pa., in square 111, is in Cameron Co.

Sterling, Pa., named in JOURNAL of Aug. 1st, is in Clearfield Co.

Messages taken for Line Lexington, Pa., are delivered either by mail or special messenger from Hatfield. Charges for special delivery, 50 cents.

Becancour Station, Que., changed to St. Julie.

Bon Aqua Station, Tenn., closed. Business for Bon Aqua Station will hereafter be mailed from Dickson.

Bath Alum Springs, Va., closed.

Rockbridge Baths, Va., closed.

Sewall's Point, Va., closed.

## NEW OFFICES.

239 Monticello, Fla.

318 Atwood, Ill.

299 Hume, Ill.

318 La Place, Ill.

297 Russell Sta., Ill.

318 Sangamon, Ill.

271 Frankton, Ind.

376 Greeley, Iowa.

\* Maine Insane Asylum, Me., 15 1 from Augusta.

\* Altamira, Mex., 425 40 from Brownsville, Tex.

\* Cuidad del Maiz, Mex., 350 33 " " "

\* Cerritos, Mex., 330 30 " " "

\* Guadalucazar, Mex., 330 30 " " "

\* Nuevo Morelos, Mex., 350 33 " " "

\* Tantoyuquita, Mex., 425 35 " " "

138 North Bradley, Mich. (formerly Buttonville.)

118 Northport, Mich.

100 Norwood, Mich.

53 Bay Side, N. J.

33 Creedmoor, L. I., N. Y.

\* Hyndsville, N. Y., 40 3 from Albany and Binghamton.

120 Pine Valley, Cattaraugus Co., N. Y.

33 Rockaway Beach, L. I., N. Y.

33 Sea Side Pavilion, L. I., L. Y.

33 West Deer Park, L. I., N. Y.

33 Yaphank, L. I., N. Y.

163 Lincolnton, N. C.

202 Gore, O.

\* Cartwright, Ont.

\* Heidelberg, Ont.

\* Inverhuron, Ont.

\* Lonsdale, Ont.

\* St. Clements, Ont.

\* Winterbourne, Ont.

140 Edenburg, Pa.

131 White Heath, Pa.

\* Levis Station, Que.

\* St. Julie, Que. (formerly Becancour Station.)

\* St. Leon Springs, Que.

## CUBA CABLE BUSINESS.

Hereafter the tariff to Panama will be one dollar for first ten words and fifteen cents for each additional word more than at present.

St. Croix, West Indies, should be added to the list given in the tariff book of "Points beyond Cuba." The rate to St. Croix will be 40 and 4 more than to St. Thomas.

WILLIAM ORTON,

President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT NOTICE No. 78, ISSUED SEPTEMBER 1, 1875.

## DEATH OF ABRAHAM KERN.

Abraham Kern, of Cincinnati, O., (Certificate No. 153, issued November 30, 1867), died at the Long View Asylum, near Cincinnati, O., July 23, 1875, of Chronic Maniacal Exhaustion.

One dollar for assessment 78 is due from members holding certificates numbered up to and including No. 2,476.

Members who have not yet remitted for assessment 77, (notice of which was issued Aug. 2, 1875), will please consider this a duplicate notice that, that assessment is due and should be paid at once.

## RECEIPT OF ASSESSMENTS.

NEW YORK, August 25, 1875.

## ASSESSMENT No. 78.

21, 64, 103, 131, 138, 208, 211, 217, 277, 289, 464, 509, 564, 565, 615, 622, 626, 742, 843, 859, 911, 915, 916, 917, 941, 977, 1024, 1178, 1182, 1185, 1289, 1333, 1357, 1407, 1490, 1502, 1503, 1516, 1527, 1986, 1994, 2026, 2066, 2103, 2164, 2240, 2287, 2310, 2346, 2389, 2390, 2391, 2442.

## ASSESSMENT No. 77.

5, 33, 46, 52, 54, 58, 61, 65, 67, 72, 75, 80, 91, 93, 95, 99, 121, 129, 134, 141, 142, 144, 153, 179, 182, 184, 215, 220, 235, 244, 247, 254, 257, 267, 276, 278, 279, 280, 281, 282, 283, 285, 302, 312, 349, 360, 367, 379, 380, 392, 393, 402, 405, 406, 413, 425, 426, 431, 463, 466, 468, 469, 470, 471, 475, 511, 512, 514, 532, 533, 545, 546, 548, 554, 560, 573, 576, 577, 587, 603, 618, 672, 678, 680, 685, 708, 734, 735, 750, 751, 756, 769, 791, 831, 855, 858, 874, 876, 883, 886, 905, 922, 932, 943, 952, 976, 995, 998, 1001, 1005, 1013, 1023, 1040, 1055, 1074, 1076, 1093, 1100, 1101, 1102, 1147, 1152, 1196, 1200, 1226, 1227, 1232, 1233, 1248, 1251, 1260, 1274, 1276, 1303, 1304, 1325, 1364, 1365, 1368, 1385, 1390, 1391, 1437, 1440, 1449, 1453, 1482, 1483, 1484, 1517, 1518, 1524, 1532, 1537, 1546, 1550, 1554, 1555, 1569, 1572, 1582, 1589, 1593, 1594, 1596, 1620, 1634, 1637, 1656, 1663, 1676, 1681, 1695, 1699, 1707, 1714, 1721, 1728, 1735, 1732, 1736, 1745, 1775, 1791, 1810, 1811, 1812, 1815, 1817, 1847, 1864, 1881, 1907, 1911, 1913, 1914, 1916, 1919, 1938, 1943, 1950, 1965, 1973, 1999, 2000, 2001, 2021, 2024, 2027, 2057, 2083, 2094, 2114, 2138, 2142, 2165, 2181, 2191, 2195, 2196, 2199, 2201, 2202, 2204, 2205, 2206, 2213, 2215, 2216, 2220, 2224, 2230, 2231, 2241, 2244, 2256, 2263, 2268, 2269, 2272, 2295, 2296, 2297, 2298, 2300, 2301, 2303, 2323, 2330, 2331, 2333, 2334, 2335, 2336, 2345, 2350, 2351, 2354, 2355, 2356, 2371, 2374, 2378, 2379, 2386, 2392, 2393, 2416, 2418, 2419, 2421, 2424, 2431, 2432, 2433, 2434, 2436, 2437, 2439, 2440, 2441, 2443, 2447, 2453, 2467.

## ASSESSMENT No. 76.

496, 499, 506, 508, 600, 1104, 1375, 1553, 1677, 1743, 2150.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
NEW YORK, September 1, 1875.

To all Transfer Agents:

On September 6th, money order offices will be established at the following named points.

In S. B. Giffords' District, Fultonville, N. Y.

In R. C. Clowry's District, Texarkana, Ark.

On September 6th, Cape May and Atlantic City, N. J., will be discontinued as money order offices.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, May 2, 1873.

## EXECUTIVE ORDER, No. 147.

Rule 94 is hereby modified as follows:

No original sent message, or duplicate of a received message, will be allowed to pass out of the possession of the Company, except by authority of an Executive Officer.

Whenever a manager or other employé is subpoenaed on the part of the sender or receiver of a message, to produce it before a court or other legal tribunal, he will comply with the subpoena, and afterward return the message to the files. When subpoenaed by any party other than the sender or receiver, he will take the message into court and submit to the Judge that he ought not to produce it, the communication being privileged, and that he cannot do so unless a rule of court is entered requiring it. If such rule is entered the manager must obey it, asking the clerk to give him a copy of the rule and message.

The subpoena and other papers in connection therewith should be retained on file with the message to which they relate.

WILLIAM ORTON,  
President.

## BORN.

BEARD—At Brooklyn, N. Y., August 1, 1875, a daughter to James R. Beard, of the Vice-President's office, New York.

DENVER—At Springfield, Mass., July 31, 1875, a daughter to W. J. Denver, manager W. U. Tel. office.

LOGAN—At Chester, Pa., July 29, 1875, a son to J. A. Logan, operator W. U. office, Jersey City, N. Y.

## MARRIED.

GUIDOUT-KENNEDY—At the residence of the bride's parents, Peoria, Ill., June 10, 1875, by Rev. Mr. Bailey, J. Guidout, agent and operator, C. B. and Q. R. R., Brimfield, Ill., to Miss Emma Florence Kennedy.

HEMPHILL-PHILLIPS—At Unionville, Iowa, July 22, 1875, by Rev. C. R. Norton, Will. H. Hemphill, agent and operator, C. R. I. and P. R. R. Co., to Miss Emma J. Phillips, of Unionville.

HERRON-GRUBER—At the residence of the bride's parents, Cameron, Pa., August 15, 1875, by Rev. L. J. Heck, W. L. Herron, agent and operator, P. and E. R. R., of Canandaigua, N. Y., to Miss Rose A. Gruver, of Cameron.

QUICK-HANFORD—At the bride's home, in Mott's Corners, Tompkins Co., N. Y., June 9, 1875, by Rev. A. B. Chase, Martin A. Quick, manager W. U. Tel. office, Ba h, N. Y., to Miss Belle L. Hanford.

ROLFE-CLAUSING—At Batesville, Ind., July 22, 1875, by Rev. H. Dolle, J. F. Rolfe, agent and operator, I. C. and L. Ry., to Miss Emily C. Clausing, of Milton, Ind.

## DIED.

SAWYER—At Wilmington, Del., August 15, 1875, Arabella O., wife of W. H. Sawyer, of American District Tel. Co., Philadelphia, and daughter of W. H. and J. Baird, of Wilmington.

STEWART—At Key West, Fla., July 14, 1875, of yellow fever, after three days' illness, Charles M. Stewart, operator, I. O. T. Co., aged 25 years.



## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

JUNE 1875.

## APPOINTMENTS.

D. F. Brown, B'way & Dey st. M. S. Saunders, Little Mt., O.  
 D. L. Findley, " " C. H. Weeks, Mt. Vernon, O.  
 J. M. Foster, " " J. Lyle, " "  
 Miss M. Fitzpatrick, " " Miss P. Young, Port Huron, Mich.  
 J. B. Jones, " " Miss M. Fish, Saginaw City, Mich.  
 J. B. Keene, " " E. L. Fairweather, Tittabawassee, Mich.  
 Jennie D. Laughlin, " " Miss O. Lukes, Cincinnati, O.  
 H. L. McKeldin, " " J. W. Timberlake, " "  
 A. J. Kerberg, " " Miss O. Lukes, Cincinnati, O.  
 H. Rogers, " " J. C. Ledner, Columbus, " "  
 W. R. Warren, " " Riley Sargent, " "  
 J. S. Coolbaugh, orn Exch'ge. G. T. Hutchison, Hanging Rock, Va.  
 F. M. Casey, B'way & Dey st. T. S. Spear, Quaker City, O.  
 Geo. Warren, " " S. W. Hominy, Fultonville, N. Y.  
 Geo. John, Washington Mark't. F. W. Lanulor, LeRoy, N. Y.  
 Sam. Williams, " " W. H. Landreth, Niagara Falls, N. Y.  
 E. Clocks, 554 3d Avenue. H. Williamson, Niagara Falls, N. Y.  
 J. Darrach, 407 Broadway. J. W. Ettmann, Jr., Sprakers' Basin, N. Y.  
 W. W. Wright, " " J. R. Moore, Trenton Falls, N. Y.  
 B. C. Edwards, 637 6th Avenue. J. J. Lytle, Watkins Glen, N. Y.  
 J. H. Montgomery, Spring st. J. L. Hendricks, Englewood, N. Y.  
 & Broadway. S. J. Hoffman, Alleghany Spgs., Va.  
 J. Moons, Grand Central Hotel. E. T. Kubbs, Blue Ridge, Va.  
 Matilda Malmberg, Hotel W. W. W. S. Haymond, Montgomery, N. Y.  
 Brunswick. W. S. Springs, Va.  
 W. A. Levert, Fulton Market. W. W. Gibbs, Rockbridge, A Sp., Va.  
 R. Watson, 1205 Broadway. P. Lipscomb, Rockbridge Baths, Va.  
 W. J. Johnson, 812 6th Avenue. W. F. Whitehurst, Sewell's Point, Va.  
 H. B. Derby, Albany, N. Y. H. F. Lines, Sweet Chalybeate Springs, Va.  
 S. Hessberg, " " L. G. Anderson, Sweet Spgs., Va.  
 G. Woodworth, " " W. E. Williams, Charlotte, N. C.  
 W. H. Hill, Saratoga, " " S. E. Kelly, Cleveland, Tenn.  
 D. H. Patterson, " " A. C. Taylor, Covington, Va.  
 W. A. Patterson, " " W. F. Buckley, Mechum's Run, Va.  
 Geo. Wheelock, " " W. Wrenn, Norfolk, Va.  
 M. A. Arnold, Williamstown, Mass. A. C. Hawk, Painsplains, Va.  
 Clara L. Brown, Dobbs Ferry, N. Y. P. J. Pale, Polkton, N. C.  
 J. O. Belmore, Lake George, N. Y. C. B. Morton, Richmond, Va.  
 A. Boughton, Johnsonville, N. Y. J. C. Borden, Wilson, N. C.  
 N. Y. H. Van Antwerp, Port Royal, S. C.  
 Walter Brant, America, N. Y. C. H. Chase, New Orleans, La.  
 H. W. Chambers, Dix Island, N. Y. W. D. West, " "  
 N. Y. H. H. Hunt, " "  
 Miss M. E. Ammon, New Baltimore, N. Y. J. A. Hiddick, " "  
 C. Jones, Lake George, N. Y. J. H. Hartman, Atlantic City, N. J.  
 Marion Klan, West Flushing, L. I. J. E. Foley, Atlantic City, N. J.  
 J. S. Rathbone, Brooklyn, L. I. C. W. French, Baltimore, Md.  
 R. S. Sankey, Farmingdale, " " J. J. Ingle, " "  
 C. E. Smith, Troy, N. Y. E. H. Cole, " "  
 W. E. Tice, West Point, N. Y. J. H. Davidson, Bedford Spgs., Va.  
 W. E. Van Tassel, Coxsackie, N. Y. J. C. Moore, Cape May, N. J.  
 W. L. Van Hartmyer, Greenpoint, L. I. J. S. Eves, " "  
 C. J. Warren, Bushwick, L. I. T. J. Talay, " "  
 L. H. Clark, State Line, Mass. J. H. Kennedy, Deal, " "  
 W. A. Sawyer, Waterbury, Ct. C. T. Boeck, Elizabeth, " "  
 A. C. Scoville, Worcester, Mass. D. Wisotzky, Pellyburg Spgs., Va.  
 W. S. Cunningham, Worcester, Mass. W. H. Gibbs, Hopewell, N. J.  
 W. S. Gardiner, Worcester, Mass. M. S. Stevens, Marion, Md.  
 C. W. Lawes, Concord, N. H. P. J. Mickey, Mifflin, Va.  
 Miss J. L. Granville, Highgate Springs, Vt. M. Fisher, " "  
 E. P. Hitchcock, Lake Danmore, Vt. W. D. Tyler, Minnequa Spgs., Pa.  
 Julia C. Davis, Marshalltown, Ia. P. Bossart, Philadelphia, Pa.  
 A. Beecher, Springfield, Ill. W. O. Duncan, " "  
 J. P. Kerns, Chicago, Ill. J. L. Osmond, " "  
 B. J. Forbes, " " C. Morse, " "  
 All Jones, Cal. J. H. Baccus, Slaughter, Md.  
 E. J. Hicks, Kansas City, Mo. D. J. Ragsdale, Larkinsville, Ala.  
 H. W. Davis, Monroe, La. John Snodgrass, Scottsboro, Ala.  
 D. A. Williams, Sedalia, Mo. C. L. Huckleberry, Auburn, Ky.  
 J. C. Long, St. Louis, Mo. G. C. Williams, Louisville, " "  
 Sara Boone, " " J. S. Thomas, Russellville, " "  
 C. Neuson, " " P. O. Dunbar, " "  
 J. J. Callan, " " J. L. Osmond, " "  
 Jerry Linehan, " " C. Morse, " "  
 D. E. Vigil, " " J. H. Baccus, Slaughter, Md.  
 Geo. Bruce, " " D. J. Ragsdale, Larkinsville, Ala.  
 G. T. Marley, So. City, " " John Snodgrass, Scottsboro, Ala.  
 T. Clumpe, Tidouate, Pa. C. L. Huckleberry, Auburn, Ky.  
 J. C. Kurtz, Berca, O. G. C. Williams, Louisville, " "  
 W. P. Baker, Buffalo, N. Y. J. S. Thomas, Russellville, " "  
 D. D. Morse, Cleveland, O. " "  
 C. C. Reed, " " " "  
 E. T. Reed, Detroit, Mich. " "  
 C. H. Thompson, Grand Rapids, Mich. " "

## RESIGNATIONS.

C. E. Worth, B'way & Dey st. H. P. Ludington, Grand Central Hotel.  
 E. W. Gibbons, " " V. W. Stowell, Cotton Exch'ge.  
 R. F. Brien, " " John Weigle, 14 Broad st.  
 W. V. Morgan, " " F. A. Wentworth, Spring st. & Broadway.  
 W. C. Burke, Brooklyn, L. I. S. C. Allen, Dix Island, N. Y.  
 H. L. Hues, " " B. Clark, Johnsonville, " "  
 E. A. Hopkins, " " E. Eastwood, Paterson, " "  
 J. J. Ellis, 134 Pearl st. " "  
 J. E. Honley, Corn Exchange. " "

B. H. Ellis, Bushwick, L. I. G. W. Chamberlain, Englewood, N. J.  
 D. M. Lowne, Farmingdale, L. I. W. W. Gibbs, Charlotte, N. C.  
 W. J. Vankirk, Corn Exchange. W. W. Dearborn, Charlottesville, Va.  
 Miss H. E. Wilcox, State Line, Mass. W. W. Wright, Waterbury, Ct.  
 S. P. McMahon, Galveston, Texas. S. Reese, Cleveland, Tenn.  
 W. W. Wright, Waterbury, Ct. S. Reese, Cleveland, Tenn.  
 C. H. Davis, Worcester, Mass. W. Hudspech, Covington, Ky.  
 E. O. Waite, Clinton, Ia. J. Sneed, " "  
 — Pindell, Springfield, Ill. W. P. Buckley, Gordonsville, Va.  
 S. Person, Chicago, Ill. C. L. Clare, Greenwood, Va.  
 C. E. Pillsbury, Chicago, Ill. T. H. Lankford, Kesswick, " "  
 C. E. Edgar, Alma, Cal. C. W. Owens, Mechums, Pa.  
 S. W. McMahon, Galveston, Texas. J. B. Leach, Morriston, Tenn.  
 W. A. Langley, Marshall, Tex. R. W. Cosnahan, Pampius, Va.  
 W. D. English, Monroe, Ia. Geo. Mason, Petersburg, " "  
 G. E. Singer, Sedalia, Mo. C. E. Williams, Polkton, N. C.  
 J. O. Toole, St. Louis, " " J. C. Taylor, Richmond, Va.  
 D. Campbell, " " E. T. Krebs, Wilson, N. C.  
 D. A. Williams, " " J. D. Pitts, Charlotte, N. C.  
 T. Cassidy, " " E. M. Burch, Sumter, S. C.  
 F. C. Mahony, " " J. F. Boyle, Port Royal, S. C.  
 H. F. Small, " " C. H. H. Cottrell, New Orleans, La.  
 J. D. Campbell, Va. City, Mon. H. M. Goewey, New Orleans, La.  
 J. P. Thompson, Millerstown, Pa. D. B. Mitchell, " "  
 C. F. Loesh, Buffalo, N. Y. A. S. Ayres, " "  
 N. T. Wood, Cleveland, O. G. M. Nugent, " "  
 J. S. Lavey, Green Springs, O. S. Fitzpatrick, " "  
 E. G. Reed, Gr'd Rapids, Mich. J. K. Simpson, Baltimore, Md.  
 J. L. Hutton, Port Huron, Mich. John Dennis, " "  
 J. C. Adam, Saginaw City, " John Doyle, Elizabeth, N. J.  
 C. E. Markeson, Columbus, O. — Wall, Larkinsville, Ala.  
 R. Morris, " " Davidson, Scottsboro, Ala.  
 C. H. Moore, Hanging Rock, Va. Thomas, Auburn, " "  
 A. S. Howe, Utica, N. Y. Wilson, Russellville, Ky.  
 M. S. Smith, " " C. E. Morrow, Memphis, Tenn.  
 H. H. Hunt, " "

## TRANSFERS.

From.	To.
Geo. Gallup, Plaisterville, Mass.	Danbury, Mass.
W. F. Snyder, Duxbury, Mass.	Plaisterville, Mass.
A. E. E. Scoville, New Milford, Ct.	Milford, Ct.
P. Cunningham, Worcester, Mass.	Newport, R. I.
S. E. Foley, Philadelphia, Pa.	Atlantic City, N. J.
J. C. Moore, Philadelphia, Pa.	Cape May, N. J.
J. I. Eves, Philadelphia, Pa.	Cape May, N. J.
R. S. Emerson, New York, N. Y.	Philadelphia, Pa.
J. H. Gilkerson, Louisville, Ky.	Paducah, Ky.
Dan Bailey, Sturtevant House, B'way & 34th st.	B'way & 34th st.
Addie Bullen, Hotel Brunswick, 516 Broadway.	516 Broadway.
F. Carroll, B'way & 34th st.	34th st. & 8th Av.
F. Egan, 176 Broadway.	689 Broadway.
W. Grevens, 134 Pearl st.	Long Branch, N. J.
C. H. Jennings, Fulton Market, Corn Exchange.	3 Bowling Green.
L. Kirschbaum, 34th st. & 8th Av.	Catekill Mt. House, N. Y.
W. V. Morgan, B'way & Dey st.	Sturtevant House, Williamsburg, Va.
J. F. Mears, B'way & Dey st.	134 Pearl st.
Lizzie McCallion, B'way & Dey st.	637 6th Avenue.
P. M. McCauley, G. C. Depot, 407 Broadway.	Long Branch, N. J.
W. Taylor, 637 6th Avenue.	Washington Market, N. Y.
C. E. Tapley, B'way & Bey st.	Lake Mahopac, N. Y.
J. W. Wood, Albany, N. Y.	Lake George, N. Y.
C. E. Arnold, Coxsackie, N. Y.	Albany, N. Y.
J. B. Brayton, Dobbs Ferry, N. Y.	B'way & Dey st.
Miss A. C. Martin, New Baltimore, N. Y.	Garrison's N. Y.
Miss S. J. Titus, Amenia, N. Y.	Patterson N. Y.
J. G. Stephens, New Brighton, N. Y.	30th st.
Alicia Zazinski, New Brighton, N. Y.	30th st.

## CUBA SUBMARINE TELEGRAPH.

The following is from the report of the directors for the half-year ending 30th June, presented at the general meeting on the 17th of August:

The accounts show that the gross receipts amount to £14,150, and the expenses to £2,848, leaving a sum of £11,302, out of which the directors have placed £3,155 to the credit of the reserve fund, increasing the fund to £5,000. The balance, after providing for the preference dividend, will admit of a dividend on the ordinary shares at the rate of six per cent. per annum, and leave the sum of £852 to be carried forward to the current half-year's account. They recommend that dividends be declared accordingly, payable 18th instant. In April last the new cable contracted for with Messrs. Hooper's Company was successfully laid from Cienfuegos to Santiago de Cuba, and has continued to work satisfactorily. At the same time, the old cable was cut and the ends landed at Cienfuegos, thereby establishing duplicate means of communication between Havana and Santiago, as contemplated by the directors' special report of 2d June, 1874. In the course of the half-year interruptions have occurred on the lines of contiguous companies, but, being short of duration, have not materially affected the revenue of the company. The last half-yearly meeting having been held so recently, there is little to report on this occasion. The business of the company, as will be seen, has made satisfactory progress during the half-year, and the directors have every reason to believe that such will continue.

## THE TELEGRAPH CONSTRUCTION AND MAINTENANCE COMPANY.

At the half yearly meeting of the Telegraph Construction and Maintenance Company, held on Tuesday, July 20th at the Cannon Street Hotel, London, Sir Daniel Gooch said that the work that they had had in hand during the present year had been very small. In the course of a few days, however, he hoped that the company would conclude a contract for a cable, 1,380 miles long, from Sidney, New South Wales, to New Zealand, and he trusted that for the rest of the year they would be well employed. They knew of no other work like the one he had mentioned coming forward, but they were quite prepared to take work should it present itself. He did not think it was unfortunate, even for them, that there should be a cessation for some time in the construction of these long cables. He thought this work had gone on now for some time, and with a little rest he hoped the existing cables would remunerate their shareholders better than they had in the past.

The total number of messages forwarded from postal telegraph stations in the United Kingdom for the week ended July 3, 1875, was 419,871, an increase on the corresponding week last year of 32,813.

The number of messages forwarded from postal telegraph stations in the United Kingdom for the week ended July 10th, 1875, was 423,136—an increase on the corresponding week last year of 27,898; for the week ending July 17th, 1875, was 445,294—an increase on the corresponding week last year of 34,943.

The total number of messages forwarded from postal telegraph stations in the United Kingdom for the week ended July 24, 1875, was 446,532, an increase on the corresponding week of last year of 39,181.

The total number of messages forwarded from postal telegraph stations in the United Kingdom, for the week ended July 31, 1875, was 463,360—an increase on the corresponding week of last year of 55,074.

The receipts of the Direct Spanish Company for the month of July, 1875, were £1,834, against £1,349 in the corresponding period of last year. The average time occupied in the transmission of telegrams between Madrid and England "via Santander" during July was three hours and nine minutes, including transmission over Spanish land lines.

The traffic receipts of the Western and Brazilian Company for the four weeks ending the 30th of July were £8,733, showing an increase of £710 over the corresponding period of 1874.

The receipts of the West India and Panama Company for the month of May amounted to £4,500, as compared with £2,878 in the corresponding period of 1874.

The receipts of the Brazilian Submarine Company for the month of July, 1875, were £10,230, against 8,037 for the corresponding period of 1874.

The number of messages sent by the Cuba Submarine Company during the month of July, 1875, was 2,440, estimated to produce £2,400 against 1,820 messages, producing £1,762, in the corresponding month of last year.

In the financial year ending the 31st of March, 1871, the number of messages sent by the British Post-office telegraphs was 9,850,177; in the next year, 1871-72, the number rose to 12,473,796; in 1872-73 it was 15,535,780; in 1873-74, 17,821,530; and in 1874-75, 19,253,120.

# Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

## TERMS:

TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,  
Western Union Telegraph Company.  
195 Broadway, New York.

NEW YORK, SEPTEMBER 1, 1875.

For general information we republish in this issue, Executive Order No. 147, which originally appeared in the JOURNAL of May 15th, 1873. The Order modifies Rule 94 of the Company's regulations and defines in an explicit manner the duties of managers of offices and others in charge of the Company's business, regarding the production of messages on a judicial order. From the number of inquiries lately received by us, it is evident that many managers are ignorant of the proper course to be taken in the event of such an order. It should also be understood that the personal demand or request of any officer of the law for messages, or copies thereof, or any information whatever concerning them, is not an order of a Court, and that such demands must be refused. Inexperienced managers are sometimes overawed by such a demand from an official. They will now understand the rights of the Company in such cases, and the proper course to be pursued.

It should be remembered that in sending postal cards through the mail nothing whatever should be written on the face of the card except the address. Any additional writing on the face causes an additional postal charge of five cents to be imposed. It should also be understood that postal cards cannot be used a second time. Some offices receiving an error report written on a postal card, have been in the habit of endorsing or explaining the error upon the same card and then re-address it to the sender. The Post Office authorities collect six cents upon matter of this kind. The desirability of a change in these practices will be evident to even the dullest comprehension.

At a meeting of the Board of Directors of the International Ocean Telegraph Company, on Friday, August 27th, a committee, consisting of Dr. Norvin Green and Mr. Cambridge Livingston, was appointed to draft and record in the minutes, suitable resolutions on the death of Mr. G. H. Mumford, a Director and Secretary of that Company.

## EXPRESS MESSAGES.

We recur to the subject again partly because of strictures on what we have already said, chiefly because its discussion touches fundamental points and is, so far, necessary. We are happy to be able to do so without the expletives and unworthy ribaldry which mark the communications of one of the most intelligent of its advocates, and which, while amusing enough in these sultry August days, is unworthy of its author and robs the argument of both power and respectability. Nevertheless we will state his points fairly.

1. It is claimed that the "night service" is a violation of the law of transmission according to our own interpretation of it. We claim, on the contrary, that the law operates on what are called "night messages" the same as on all others.

The night message is one which is presented during the day, the party, in consideration of a reduced rate, waives his rights of transmission until night when the law regulates the order of its class. The Telegraph Company accepts a "night message" which is a message left for transmission during a period when from well known and settled causes the lines are usually unemployed, and keeps it by direction of the writer until that period. It is sent cheaper for a reason equally clear. Night time is less valuable because less demanded. Night delivery, on the other hand, is more expensive and so it does not form a part of the "night message" service. The service is essentially unique and distinct. It is possible only at night and under a simple and universally understood direction as to delivery. The transmission of night messages is done, in all cases, conformable to law.

2. It is claimed that the "night message" system is quite as possible in the daytime as at night. To use the exact language of the claim: "If I write a message at 8 A. M., to be delivered in New Orleans at 6 P. M. (the Telegraph Company consenting), at half the rates charged for an express message, why should I not save \$1 and let my neighbor who has a hurried message, but who is behind me in handing in his telegram, have the instant use of the wires?" Now, we ask what "express" there is about such a message as that, and if we ever referred to any such under such a nomenclature? It is an unworthy dodging of the question. That is a message purposely delayed and under conditions which the writer knows no telegraph company will accept. No message is ever received by any careful company under a pledge to deliver at a specified time. The status of telegraphic transmission is simply promptness. The wires are multiplied to secure that. Now, a system of "express messages" is devised which has *no status but delay*. The truth is, the objection we made to "express messages" as stated by the English engineer, could not be met. The true point was dodged. A totally false point, that of a *delayed* message, which no sane man would call an *express* message, was presented. And it was presented with such a heat and adjective as to reveal not argument but spleen, as if an objection to the reception of messages to be sent

ahead of others for a sum paid were a high handed offence against popular rights.

We beg to say to our critic and to all men that there is not a danger connected with the telegraphic system of the world so utterly dangerous as the one of *paid priority* and to which we objected. It is systematic bribery. *It is selling the rights of others without their knowledge or consent.* The status of telegraphic transmission must be that of promptness and in the order of reception. But if it is a proposal to receive messages where promptness is not expected, where no responsibility is claimed, where delivery may be made when convenient, where the idea is the very opposite of "express messages" and should bear the name of "by canal" and charge less for them, then we may consent to sit down with our splenetic friend as the converted gambler proposed to do with those he had defrauded and "talk it over."

## THE SECRETARY OF THE COMPANY.

It is with much pleasure that we record the appointment of Mr. A. R. Brewer to be Secretary of the Western Union Telegraph Company, a position which has been vacant since the death of Mr. Mumford. Mr. Brewer entered the service in 1864, as operator at Trenton, N. J., and remained in that branch of the service at Trenton and other places between four and five years. He then, for four years, filled a very important position in the General Superintendent's office at New York, from which, in 1872, he was appointed secretary to the late Vice-President and Secretary Mumford, which position he held until his appointment as Secretary of the Company. In this appointment, as well as in others recently made, the Company has been fortunate in securing the peculiar ability which its service demands and at the same time being able to popularize the service in illustrating the certainty of promotion and reward to those whom ability, zeal and integrity render deserving.

## THE GENERAL SUPERINTENDENT OF THE EASTERN DIVISION.

The many friends of Mr. J. C. Hinchman will be pleased to hear of his appointment to be General Superintendent of the Eastern Division of the Western Union Telegraph Company's lines, to succeed the late George H. Mumford. For many years Mr. Hinchman was Superintendent of the Metropolitan (New York) district, for the American and the Western Union Companies, and in February last he became Assistant General Superintendent of the division of which he now has full charge. To this position he brings a ripe experience, which, with his well known ability and strict integrity, cannot fail to prove as profitable to the Company as honorable to himself. The division embraces all the lines east and northeast from New York City.

The International Telegraph Conference at St. Petersburg was closed on Tuesday, July 20th. The President delivered a farewell address, in which he enumerated the results of the deliberations.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, AUGUST 31, 1875.

SPECIAL EXECUTIVE ORDER.

Mr. Abijah R. Brewer has been appointed Secretary of this Company and Mr. John C. Hinchman has been appointed General Superintendent of the Eastern Division, in place of George H. Mumford, deceased.

The following business of the Executive Office will hereafter be conducted as follows:

The Money Transfer service will be under the direction of Vice-President Cornell, who will also receive for approval all requisitions for money drawn upon the Treasurer. Mr. Cornell will also have charge of all leases to or by the Company and a general supervision of the Department of Supplies. Mr. Leonard Cox will continue to act as Superintendent Transfer Service.

Estimates for Construction, Reconstruction and Repairs, and reports of finished work, will be referred to George B. Prescott, Esq., Electrician. Reports of the condition and working of the lines will be sent to the Electrician, who is also charged with the general supervision of the Operating Department, including apparatus and office supplies.

Vice-President Green will continue to have charge of the department of complaints and claims, including the general supervision of the Law business of the Company. Also, until otherwise arranged, he will have charge of the business arising under contracts with railroad companies, including the free message service.

WILLIAM ORTON,  
President.

SOUNDINGS FOR THE NEW ZEALAND CABLE.

The soundings for the projected cable between Sydney, New South Wales, and Wellington, New Zealand, which have been in progress for some months past by H. B. M. Ship *Challenger*, show that no unfavorable conditions exist in regard to the suitability of the route and the character of the bed. Captain Nares, of the *Challenger*, has communicated the following report to Sir Hercules Robinson, Governor of New South Wales, as the result of the survey:—

On the Australian coast the incline from the 100 fathoms line, which was 17 miles from the land, into a depth of 2,100 fathoms at 57 miles distance, was about 1 in 20, which is less abrupt than we had previously found to be the case further to the southward of Twofold Bay, where it was about 1 in 6. The bottom, which consists of soft ooze, then slopes down to a depth of 2,600 fathoms, at a distance of 240 miles from the coast, the temperature being 33 deg., which conditions continue for 140 miles. From this extreme depth the bottom slopes upward, with a gentle incline, with soft ooze, for 400 miles, until at a position 780 miles from Sydney and 335 miles from the entrance to Cook's Straits we obtained soundings in 1,100 fathoms. Between this and New Zealand only shallow soundings below 400 fathoms, with hard bottom, were obtained. The most westerly of these, 275 fathoms, was 300 miles from the land and 125 miles to the eastward of the 1,100 fathoms sounding. The shoal water evidently extends for some distance

further to the westward, probably as much as 100 miles, which would give a total breadth of shallow water of 300 miles. The bottom on the shoal was extremely hard, so much so that we obtained little or no samples in the sounding rods; but as both the dredge and trawl dragged freely along, without catching any irregularities, it must have been of a smooth nature. On reference to former soundings on the general chart it is evident that a somewhat similar bank extends for a considerable distance to westward of the north cape of New Zealand; such being the case, the shoal is probably continuous and shallow water may be expected all along the western side of North Island, but I see no reason to suppose that deep water does not extend to within a very short distance of the southwest cape of the Middle Island, which is also the nearest land to Australia.

A COMPARATIVE STATEMENT.

Statement showing the amounts received by the Anglo-American Telegraph Co. during the months of May, June and July, 1874, under the tariff of \$1 per word; and the receipts for the corresponding period of 1875, with the tariff at 50 cents per word:

	1874		1875.	
	No. of Messages.	Amount Received.	No. of Messages.	Amount Received.
May.....	21,354	£56,216	27,184	£33,940
June.....	22,033	58,758	28,892	36,650
July.....	20,905	56,593	28,897	38,270
	64,292	£171,567	84,973	£108,860

It thus appears that the reduction of tariff to 50 cents per word has caused a falling off in the revenue of 36.55 per cent. for the three months in which it has been in operation; while the messages have increased 32.17 per cent.

THE FUNERAL OF GEORGE H. MUMFORD.

The funeral of the late George H. Mumford, Vice-President of the Western Union Telegraph Company, took place at Rochester, N. Y., on Tuesday, August 17th. At 10 o'clock services were held at the Mumford mansion by the Rev. Israel Tooke, D. D., rector of St. Paul's Church. The remains were then taken into St. Paul's Church, escorted by a large number of distinguished men. Preceding the remains as an escort of honor, were the Hon. William Orton, President of the Company; Dr. Norvin Green, Vice-President; Gen. Anson Stager, J. Van Horne, J. B. Van Every, A. H. Watson, J. C. Hinchman, W. J. Holmes, James D. Reid, S. B. Gifford, J. S. Bodlow, J. W. Simonton of the Associated Press, A. S. Brown, and other gentleman prominently connected with the Western Union Telegraph Company. Among others present were the Hon. G. Clarkson, Mayor of the city; the Hon. O. H. Palmer, the Hon. Hiram Sibley, the Hon. Roswell Hart, Judge H. G. Warner and the Hon. H. M. Dewey. The funeral service of the Episcopal Church was conducted by the Rev. Dr. Foote, assisted by the Rev. C. H. Allen. The procession then formed and took its way to Mount Hope Cemetery. It was one of the longest ever seen in Rochester.

STRUCK DEAD BY LIGHTNING.

From the Sioux City (Iowa) Journal.

While the thunder storm of yesterday afternoon was raging at a distance of apparently a couple of miles from this place, a singular freak of nature took place in the striking by lightning of the depot, and the striking and killing subsequently of J. H. Boyer, the postmaster and blacksmith of this place. At about 5 o'clock in the afternoon, at which time not a cloud obscured the sky overhead or stood between the sun and the town, a terrible flash of lightning, followed by a deafening peal of thunder, struck the wires of the telegraph office and set it on fire. The damage done to the telegraphic apparatus was most complete, the wires being torn to pieces and the different instruments being almost without exception distorted and broken and completely wrecked. Immediately after the stroke John H. Boyer, who was in his shop at the time, ran out in the street toward the depot, where some boys had been playing. He approached them rapidly and said, "Why, boys, I thought some of you had been struck. I was frightened on account of you." He evidently had it in his mind that the terrible shock might have frightened his family, as he started toward his home immediately. When within about fifty yards of the house, from the front window of which his wife was anxiously watching his approach, another vivid flash of lightning dazzled the eyes of all, and ere the thunder had ceased rolling the naked body of the unfortunate man was seen to be lying prone upon the ground. A number of people, among them his wife, rushed to the spot, and so horrible was the situation that it was not until he had been carried to the house that a full appreciation was had of the terrible death which nature had inflicted upon him. An examination of the body, from which every vestige of clothing, not excluding even a pair of cowhide boots, had been instantly torn, showed that the subtle and terribly fatal fluid had first struck him on the top of his head, whence, though the skull was left apparently intact, the hair had been burned off for the space of the size of a silver dollar. Thence the fluid had run down the side of his face, as was shown by a clearly cut track, to the shoulder, and thence to the heart, where it apparently had spread all over the body.

The terrible power of the fluid was shown by the presence in the ground, on the spot where the unfortunate man's body had been picked up, of a hole eight feet deep by actual measurement. The clothing of the deceased was found to have been shredded and when first discovered was on fire, while the silver watch he carried had been driven into the ground, and when lifted up, it was found that the works had been fused into a lump of shapeless metal.

The Peruvian exploring vessel *Chalaco* has been engaged in taking preliminary soundings between Chorillos in Peru and Chaldern in Chili, with the view of laying the submarine cable between these two points. The route examined was on a line starting from Chorillos and passing within four miles of the Island of San Gallan, forming here a slight deviation towards the coast, and then running parallel to it for about twenty miles, about eight or ten miles off. The depth of the sea as far as San Gallan is not great, not exceeding a maximum of one hundred fathoms, the bottom all along being a mixture of mud and gravel. From thence the soundings begin increasing as far as the Morro of Chala, where a depth of 600 fathoms was noted. The submarine exploration, so far as it goes, proved that no difficulties would be met with in laying the proposed cable.







WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, July 2d, 1875.

This Company is now prepared to pay the principal and accrued interest of its Bonds, maturing November 1st, 1875, upon delivery of the Bonds at this office.

R. H. ROCHESTER, Treas.

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This Holder is intended to save the last half or third of the pencil.

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When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

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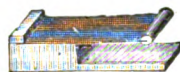
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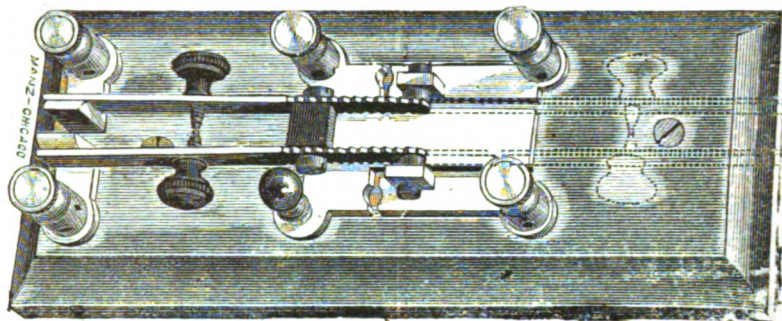
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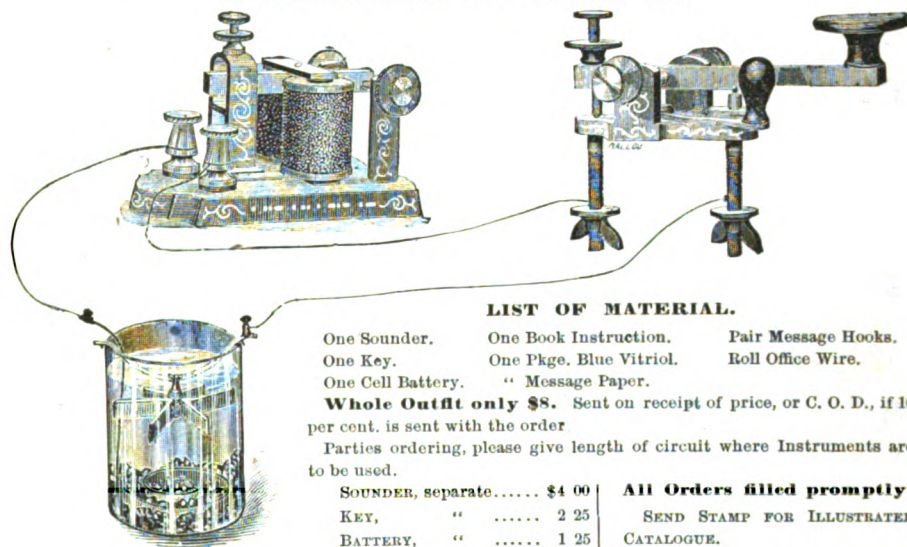
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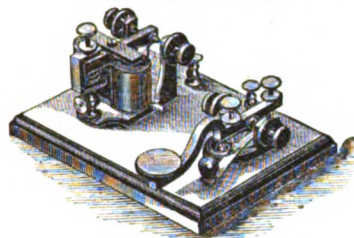
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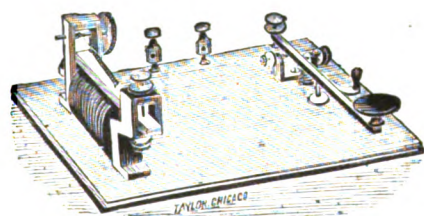
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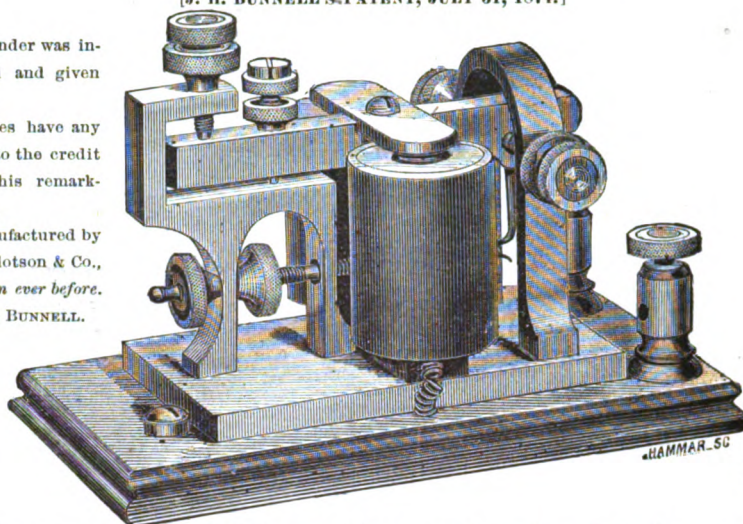
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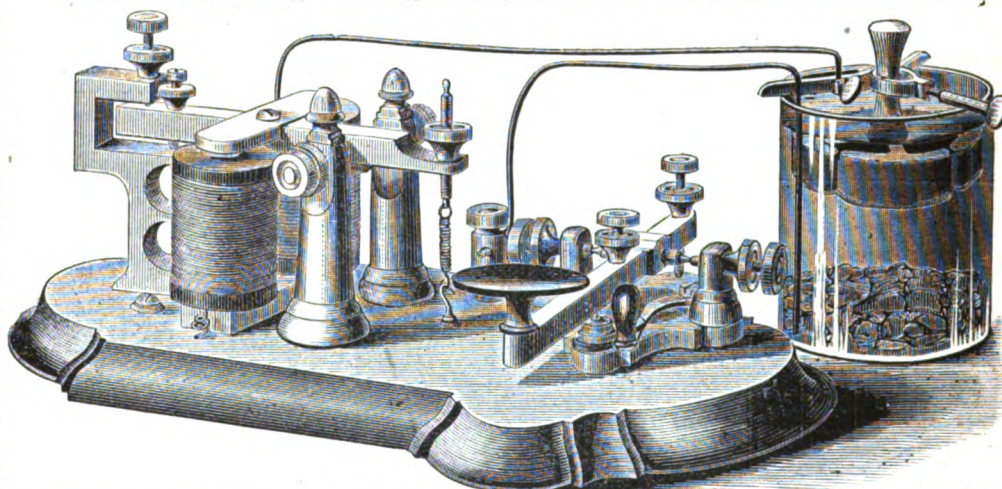
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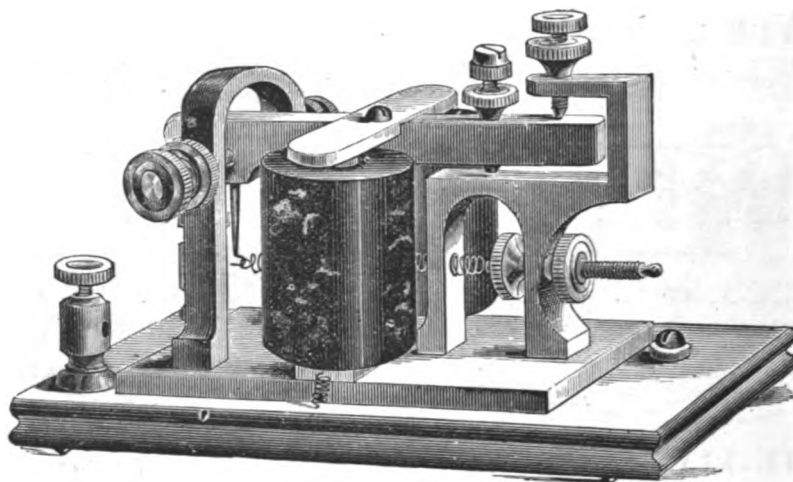
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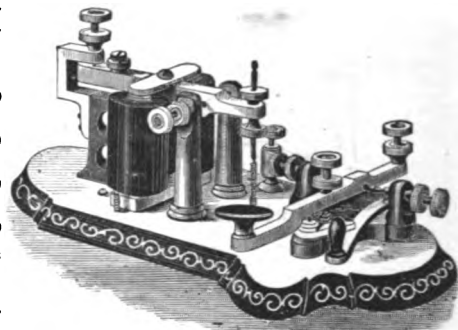
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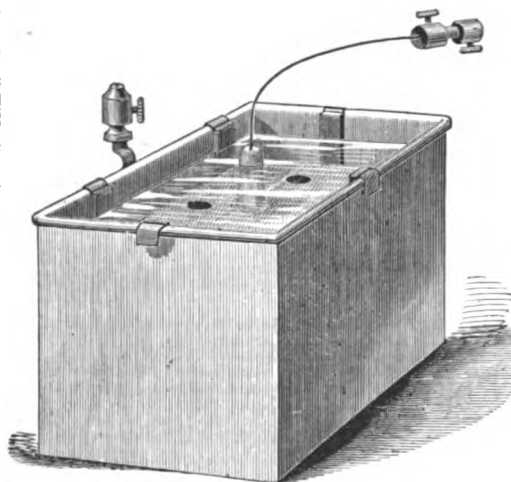
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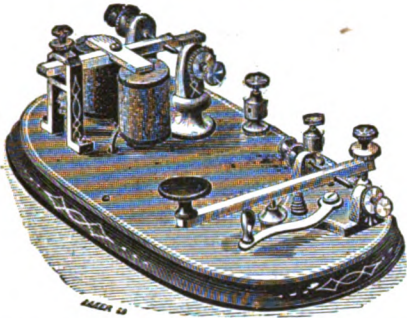
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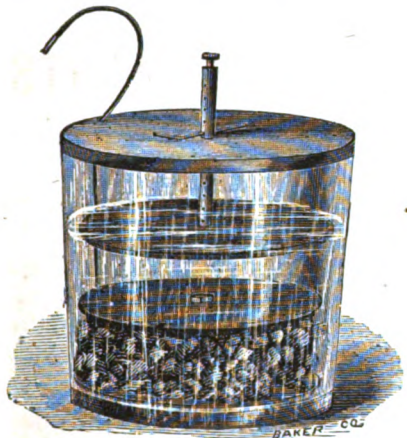
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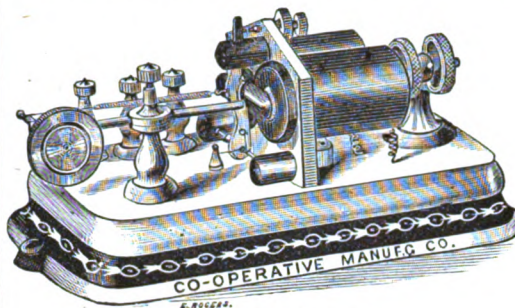
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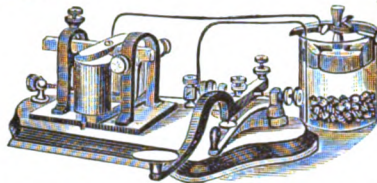
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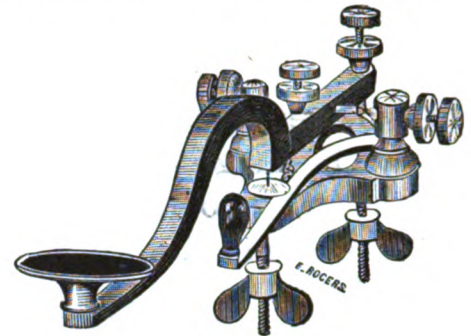
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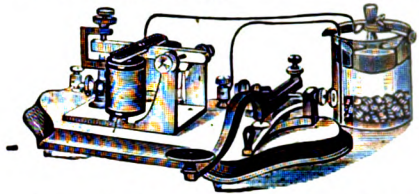
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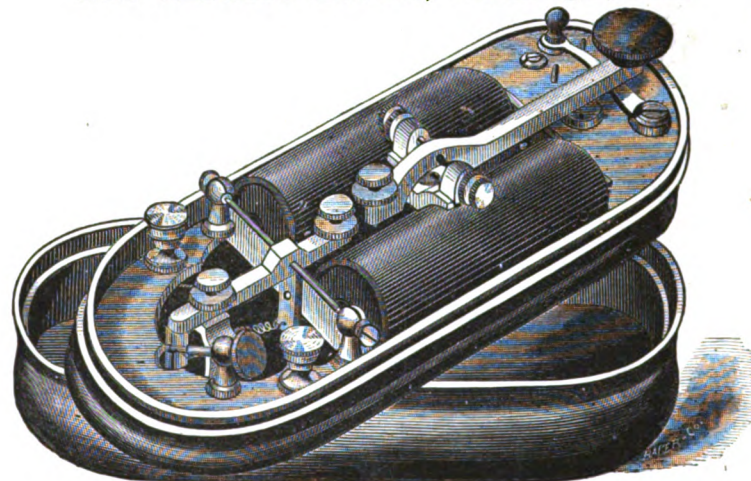
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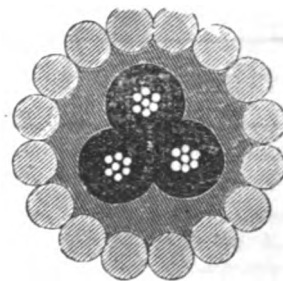
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 18.

NEW YORK, SEPTEMBER 15, 1875.

WHOLE NO. 189.

## SMITH'S DUPLEX TELEGRAPH.

The successful introduction of the Duplex system of telegraphy on the lines of the United States a few years since, followed by its extensive employment not only in this country, but in all parts of Europe and Asia, has greatly stimulated the efforts of inventors to improve and perfect the apparatus and methods employed for this purpose. The Duplex has already become an essential feature of modern telegraphy, and every effort to simplify its methods, and increase its reliability and convenience of operation, if attended with any degree of success, is obviously a matter of great practical importance.

The conditions necessary to be fulfilled in duplex working are as follows: The receiving instrument must be so connected to the line and to the earth, that while remaining wholly unaffected by the movements of the transmitting key at the homestation, it will respond to every movement of the key at the distant station. In most of the systems of duplex telegraphy hitherto invented or used, this result has been effected by making use either of the principle of the differential relay, or of that involved in the management of circuits known as the Wheatstone bridge.

Mr. Gerrit Smith, the Assistant Electrician of the Western Union Telegraph Company, has invented a method of duplex working which differs materially from any of the systems referred to above, and which has proved so successful in its practical working, as to be worthy of a detailed description in our columns.

The principle on which the operation of Mr. Smith's system depends, will be best understood by reference to the familiar illustration in Fig. 1. Suppose  $a b c$  to represent a telegraph line, attached at one end  $a$  to the grounded battery  $E$ , of say 100 cells, while the other end  $c$  is connected directly to the earth. Let the resistance of the line be 4,000 ohms. A current of moderate and uniform strength would flow through the line from the positive pole of the battery at  $E$  to the earth at  $c$ . If a wire having practically no resistance, is now connected from the line wire at  $a$  to the ground, as indicated by the dotted line  $a_1$ , a very powerful current will flow through it. This current is equal to the full power of the battery  $E$ , in other words, the battery is placed on short circuit, and the current flowing over the line to  $c$  becomes practically nothing. Now instead of the wire  $a_1$ , if a second battery of 100 cells is connected between the point  $a$  and the ground, with its positive pole likewise to the line, its current will exactly neutralize that of the battery  $E$  in the short circuit, and a current will pass over the line from  $a$  to  $c$  as before.

If the connection at  $a_1$  be made to the earth from the middle of the line at  $b$ , a current will flow from that point to the earth as before; but it will be much weaker than in the former instance, as it is obliged to pass through 2,000 ohms of line resistance between  $a$  and  $b$ . This circuit may be neutralized as in the

former case, by inserting a battery in the wire  $b_1$ , with its positive pole to the line, but in this case, the current being weaker, a smaller number of cells, say 50, will be sufficient to oppose it, and when this is done, the current from  $E$  will pass to  $c$  as before.

It will be readily understood that it is not at all essential that the point  $b$  should be in the geographical centre of the line, to produce the above effect. The 2,000 ohms between  $a$  and  $b$  may consist merely of a resistance coil, while the 2,000 ohms between  $b$  and  $c$  may consist of, say 100 miles of line, more or less. Precisely the same result will follow as in the first instance. The battery of 50 cells at  $b_1$  will balance the 100 cells at  $E$ , in either case; there will be no current whatever in the wire  $b_1$ , and a relay inserted in it would remain entirely unaffected if the

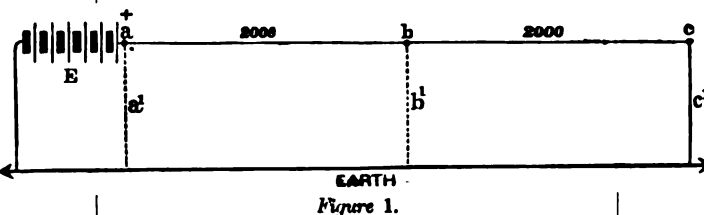


Figure 1.

circuit of both batteries is opened and closed simultaneously. A current would however flow from  $b$  to  $c$ , whenever the two batteries were connected to the system.

Mr. Smith has applied this principle to the working of a duplex in the following manner. The transmitter  $T$  (see fig. 2), is worked either directly by the finger of the operator, or preferably by a magnet, local battery and finger key  $K$ , as in the Stearns duplex. It is so arranged that the two batteries  $E$  and  $E_1$  are both placed in circuit simultaneously whenever the key is depressed. The circuit of battery  $E$ , when closed, passes through the wire 1, spring  $s$  of

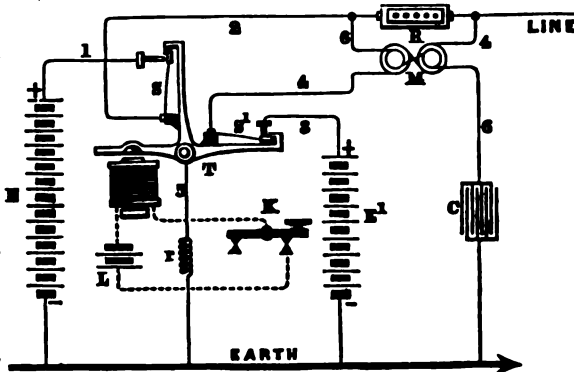


Figure 2.

the transmitter  $T$ , wire 2, and rheostat  $R$ , to the junction of wire 4 and the line, where it meets the opposing current from battery  $E_1$ , which comes through wires 3 and 4, including one wire of differential relay  $M$ . The current of the principal battery  $E$  is materially weakened by the resistance of the rheostat  $R$ , so that a much smaller battery at  $E_1$  is

sufficient to oppose its tendency to find its way back to the earth through the wire 4 and relay  $M$ . It therefore goes over the line to the distant station, and operates the instrument at that point. Thus we have the first condition of duplex working provided for, as the two batteries  $E$  and  $E_1$  exactly neutralize each others effect in the wires 3 and 4 and relay  $M$ .

The currents received from the distant station, over the line, divide at the junction of the wire 4, one portion going to the earth through the rheostat  $R$  and wire 2, and the other portion through the wire 4 and relay  $M$ , recording the signal. It will be seen that so far as the strength of the outgoing current is concerned, it is quite immaterial what the resistance of the relay  $M$  is, and this may therefore be made of whatever resistance will produce the most favorable effect with the incoming current.

An ordinary relay might be used with this duplex, but in practice it has been found preferable to substitute a differentially wound relay. The extra circuit of this, forms a part of the wire 6, which is attached to the battery 2, and to one side of a condenser  $C$ , the other side of which is connected to the earth. By this contrivance, the return current or static charge is effectually compensated. When the circuit of the battery  $E$  is closed, the condenser  $C$ , takes a charge. When the battery is removed from the circuit, the line and the condenser discharge themselves simultaneously, but the two charges pass off in opposite directions through the two wires of the differential relay, and their effect upon its cores is therefore null.

The resistance of the spark coil  $r$ , should be made equal to that of the joint resistance of the batteries  $E$  and  $E_1$ . The balance of the whole system is obtained by varying the rheostat  $R$ .

Instead of a transmitter with the continuity preserving springs  $s s_1$ , an arrangement might be used which would short-circuit both batteries when the key is up, by a connection which would be interrupted when the latter is depressed, so as to allow the current to flow to line.

Mr. Smith's duplex system has been tested for several weeks, on a number of different lines of the Western Union Company, between New York and Buffalo, with the most satisfactory results. The resistances of these lines in good weather vary from 5,000 to 6,300 ohms. With 175 gravity cells in battery  $E$ , and 135 similar cells in battery  $E_1$ , the resistance which is required in  $R$  to effect a balance with 6,300 ohms in the line, is about 1,711 ohms. The differential relay used had a resistance of about 300 ohms on each side.

Mr. Smith obtained a patent for the above described duplex system on the 6th of July, 1875.

During a recent thunder-storm the East Boston fire alarm bells were struck by lightning three times in as many minutes.

## CONTRACTS BY TELEGRAPH.

The telegraph is coming into use so largely that contracts made by means of dispatches will soon create a new department of commercial law. It is a striking illustration of the inter-dependence of all the relations and duties of a civilized people, that improvements in material condition, inventions reaching into many forms of service, modifications of modes of business or pleasure, sooner or later effect our laws, enlarging their scope or dividing their operation to fit new conditions. Railway transportation has drawn the law of "common carriers" out of its old ruts to some extent to adapt it to a larger system. Steam shipping has extended the circle of maritime law. The naval warfare of England and France during the last years of the last century and the first part of this almost created the system of admiralty law, and its prize adjudication and rights of neutrals. Now the telegraph is putting its work into changes or enlargements of commercial law. What completes a telegraph contract? When do the parties become bound by the propositions made in dispatches? This may be, and has already been a serious question, involving thousands of dollars. The English courts have been ruling that a contract accepted by telegraph binds the acceptor from the delivery of the affirmative dispatch to the operator at his end of the line, and not from the delivery of the copy at the other end to the other party. This seems to be a suggestion of the ruling cases of contracts made by letter. These latter bind acceptors from the time the letters are posted. The lien, we will call it, of the bargain, adheres from the time the assent necessary to complete it has been given, and put in due course of transmission to the other party. It is then beyond recall. But a letter differs from a despatch materially. 1st, in the fact that the former is the contracting party's own work, and no third person's mistake can effect it; and 2d, in the fact that the delivery of a letter, going by mail, is hard to prove except by the receiver, who may be deeply interested in denying either the receipt or the date. A dispatch can always be fixed in date even to the hour and date of reception, without the receiver's evidence, and a dispatch may easily be materially affected by a mistake of the transmitting or receiving operator. This is common enough. Two such differences might suggest a difference of ruling as to the time of giving effect to a telegraphic contract. Changing that time to the time of delivery of the accepting message to the proposer would give an opportunity to the acceptor to learn, through the operator, if the message had been correctly sent. And as both times sending and receiving and delivering can be proved by disinterested parties, there would seem to be no good reason why that opportunity for settling the correctness of the message, and the certainty of its receipt, should not be allowed. The operator is held by the law to be the agent of the party sending a message, and his blunders or failures are set down to the account of this principal, and it can be hardly more than fair that the principal should have the means of determining whether his agent has fairly represented him or not. Of course the telegraph company is finally responsible for errors or failures, but the first resource is against the author of the wrong or defaulting message by the party injured, and that liability ought to give the author all convenient means of settling clearly the correctness of the transmission by which creates it. The English ruling deprives him of this obvious right, by binding him from the moment the despatch is gone to the transmitting operator.—*Indianapolis News.*

The Nevada and North Telegraph Company have completed their lines to Boise City, Idaho.

## IRON TELEGRAPH POLES.

When the progress of telegraphic extension rendered it necessary to construct long ranges of lines through the semi-civilized regions of India, Central Asia, Australia and South America, where it is often difficult and even impossible to procure suitable timber for poles, or where the peculiarities of climate insured the speedy decay of wooden poles, even if it were possible to make use of them; the economy of using iron poles became so apparent as to scarcely require discussion. When we consider the difficulties of transportation, labor and maintenance, in these partially civilized countries, inhabited by a rude and scattered population, and compare the relative first cost and duration of wooden and iron poles under such conditions, the saving which must result from the employment of the latter is readily seen. But in the more thickly settled countries

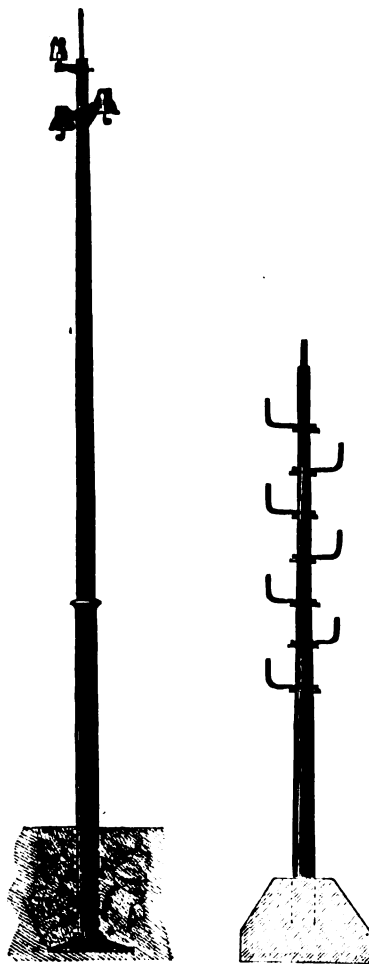


Figure 1.

Figure 2.

of the world, where transportation is abundant and cheap, and the cost of inspection and maintenance is comparatively low, the question of relative economy becomes a much more complicated one. It is not proposed to enter into an extended discussion of the relative cost and advantages of iron and wooden poles, for the reason that so many different considerations enter into the question, that perhaps nothing short of a somewhat lengthened experience with both systems of construction under corresponding conditions would enable results, even approximately correct, to be arrived at.

The subject of iron poles has by no means been neglected by inventors. Many designs have been proposed, some of which have found general acceptance in practice, where the conditions have been favorable. Among these numerous designs, we have selected for description and illustration, some of those

which have not only been adopted to a greater or less extent in practice, but which will at the same time serve as examples of radically different principles of construction.

One of the earliest inventors who turned his attention to the subject of iron poles was that eminent telegraphic engineer, C. W. Siemens. Considering that the object in view would be most completely met by a design which should combine lightness and convenience of construction, with the maximum degree of stability and resistance to sudden strains, as well as to oxidation, he was led to abandon the ordinary method of securing poles by setting a considerable length of them in the ground, and to make use of a horizontal wrought iron foot-plate buckled or corrugated into the form of a shallow inverted dish, which combines a great degree of rigidity with a peculiar toughness which enables it to yield without injury to sudden and excessive strains. The portion of the post which is partly buried in the ground, and is, therefore, exposed to the action of moisture both from the earth and the atmosphere, is made of cast iron and is of a tubular form. This tube is fastened to the foot-plate by four bolts, and is provided at its upper end with a socket for the reception of the upper tube. The latter, which forms the principal part of the pole, above ground, is made of wrought iron. Figure 1 shows the Siemens pole as it appears when erected and ready to receive the wires. The upper tube is cylindrical for a distance of about two feet above the socket, and from thence tapers gradually to the top. This form ensures a distribution of metal, which, with a minimum expenditure of material, gives a maximum degree of rigidity or resistance to a horizontal strain. The upper and lower tubes are cemented together by means of a fused mixture of sulphur and oxide of iron.

The height and dimensions of these poles vary according to circumstances. If only one or two wires are required, and economy is an object, poles having a total length of 19 feet 8 inches are used, standing 17 feet above the ground when in position, it being usual to place the post 2 feet 8 inches in the ground. The total weight of such a pole is 184 pounds, and as it may be transported in three separate parts, the weight of the heaviest piece will be less than 100 pounds. At all points where the line is exposed to an extraordinary strain, a heavier pole, weighing 295 pounds, is made use of. For a heavier class of lines a larger sized pole is made, weighing 254 pounds, with extra poles weighing 340 pounds. The ordinary number of poles to a mile is about 21.

Iron poles of this description were first erected by the firm of Siemens Brothers, in Spain and South Africa, as long ago as 1863. Since that time more than 180,000 of these poles, representing over 9,000 miles of line, have been erected in New Zealand, Ceylon, India, Egypt, Persia, Russia, Mexico, Brazil, the Argentine Republic, Chili and Peru, and are said, in all cases, to have remained in perfect working order ever since their erection.

As a rule the Siemens poles are estimated to cost from two to three times as much as good wooden poles of corresponding strength; say from \$6.50 to \$17.50 each, according to size and strength.

In many countries, however, where both wooden and iron poles would have to be transported over great distances, by such means as are usually available in half-civilized countries, iron poles become as cheap as wooden ones at the point of erection, owing to their weight being so much less, and their transportation so much easier, on account of being carried in pieces of convenient weight and bulk. It will, therefore, be readily seen, that in tropical countries where wood is subject to dry rot, and where wooden poles have to be renewed every few



years, that the relative advantages of iron poles of this description are very great indeed. In civilized countries, however, the advantages to be gained by the use of these poles instead of wooden ones is not so obvious, and we do not find that they have as yet been introduced to any considerable extent.

The rapidity with which wooden poles were found to decay, and the expense and interruptions occasioned by the continual renewal of the poles and the transfer of the lines from the old poles to the new, led the telegraphic administration of Switzerland to construct an experimental line upon iron poles, as early as 1857.

The experiment was continued in 1858, but the T iron which was employed for building the first lines, was replaced by two or more cylindrical tubes



Figure 3.

screwed together by means of a threaded coupling. After an experience of three years, which served to demonstrate the fact that this manner of joining the poles did not insure a sufficient degree of rigidity, this form was in turn abandoned. After successive trials made with specimens of various designs, it was at length decided upon to use conical tubular poles formed of a single piece, as this seemed likely to fulfil all the necessary conditions.

The length of these poles varies according to circumstances from about 8 feet 4 inches to 24 feet 7 inches, but practically they have always remained within the limits of 11 feet 4 inches and 18 feet 8 inches. The minimum diameter measured just below

the top of the pole is invariably 1.6 inches; it increases regularly toward the base in all cases, so that a pole 12 feet long has a diameter of 2.56 inches, and an 18 foot 8 inch pole, a diameter of 2.95 inches, at the base. The thickness of the iron is uniformly 0.2 inch.

The poles are firmly secured in the ground by means of sockets of stone whose dimensions depend upon the length of the poles. For the small sizes these sockets are about two feet square. The insulator brackets are placed in round holes drilled transversely through both sides of the pole, and are fastened by iron wedges or keys.

Fig. 2 represents one of the smaller sized poles arranged for eight wires.

The price of the poles has varied but little since 1861. The mean per pole, delivered free in Switzerland, is as follows:

For poles 11 ft. 3 in.	weighing 41.45 lbs.	\$1.93
" " 12 " 9 "	" 48.34 "	2.33
" " 14 " 3 "	" 55.94 "	2.55
" " 15 " 9 "	" 63.94 "	2.95
" " 17 "	" 73.91 "	3.47
" " 18 " 8 "	" 82.9 "	3.95

The durability of these poles is of course almost unlimited, provided they are properly covered, from time to time, as may be required, with a coat of varnish for the protection of the iron. The results obtained in regard to the insulation are said to be not unfavorable, and the Swiss administration has had reason to be very well satisfied with this system of construction. It presents, however, one inconvenience, which could hardly have been foreseen, but which will nevertheless be somewhat difficult to remedy. This inconvenience arises from the comparatively small number of wires that these poles are capable of accommodating. In 1861, when the system of construction with iron poles, began for the first time to be used to any considerable extent, there were only some ten miles of line in all Switzerland, having four or more wires, and it was then thought that in providing for ten or twelve wires, all possible requirements would be exceeded. At the present time some of the lines built in 1861 and 1865, with iron poles, have more than fifteen wires, so that it has become necessary to duplicate the lines, a result which might have been postponed for several years if wooden poles had been employed.

Figure 3 represents the iron post which has been adopted by the Bavarian Administration, together with its accessories, which will be hereafter described. The conditions of the contract for material which is imposed upon the contractors, are such as to oblige them to employ for all the metallic parts, nothing but iron of the best quality, free from flaws and fissures, and the contract also reserves to the Telegraphic Administration the right to reject any piece which, in its judgment, does not come up to these requirements.

The metallic posts employed are made of rolled iron and are cut to three different lengths: viz. 5, 6 and 7 meters. The outline of the transverse section is the same for the three sizes, that of an H or double T as shown in Figure 4.

The reason for the selection of this particular form was as follows: In consequence of the high price of iron, it was necessary to adopt a system of construction which would reduce the labor of setting the poles as much as possible, and on the other hand, give the iron such a form as the law of strength of materials shows to be most advantageous.

As the greatest strain on the posts is not in a direction parallel to the wires, the wind not acting upon them in the direction of the tension; the most proper form for a telegraph post is, therefore,

not that having a circular transverse section but that in which the section resembles a double T, having its ends placed perpendicular to the strain of the wires. With this form the construction of poles is neither very expensive nor is much additional work required in fitting them up. The cross-arms and insulator pins are also very easily attached.

After being rolled out, the poles are cut to the desired lengths and the ends carefully filed. In the center of the groove of each pole five holes, about 0.67 inch in diameter, are drilled, the centre of the upper hole being 7.87 inches from the top of the pole, and the distance between two holes 15½ inches. Opposite these holes and on alternate sides of the pole recesses are cut out to receive the cross-arms.

In order to protect the poles from action of the elements, they are carefully freed from filings and rust, washed with lime-water and then plunged while still wet, into a bath of boiling oil, after which they are covered with a coat of red lead.

The cross-arms used with these poles are of an L form and are composed of the same metal as the poles themselves. Figure 4 shows a transverse section of one. They are made in three lengths, viz: 2 feet 7 inches, 3 feet 7 inches, and 4 feet 7 inches.

In one face of the cross-arm, midway between the ends, a hole 0.67 inch in diameter is drilled; two additional holes are made in the other face of the 2 foot 7-inch arms, and four holes in the 3 foot 7-inch and 4 foot 7-inch arms. The latter holes are also 0.67 inch in diameter and the distance between their centres and the axis of the pole are as follows:

For the 2 foot 7-inch arms	1 foot 4 inches.
" 3 " 7 "	" 8.3 in. and 1 foot 8 in.
" 4 " 7 "	" 1 ft 5 in. and 2 ft. 8 in.

The other details for completing the arms are the same as for the poles.

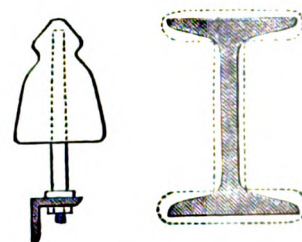


Figure 4.

The cross-arms are fastened to the poles with bolts 2½ inches long and .59 inch in diameter. The heads of the bolts are 1.2 inch in diameter and .03 inch thick. Hexagonal nuts 0.69 on a side and 0.3 inch thick, are used to secure the bolts; the latter should be coated with black varnish.

The pins for supporting the insulators are formed of iron rods, one end being furnished with a thread and nut, as shown in figure 4.

The total length of the pins is 7.8 inches, and their maximum diameter 0.59 inch. The shoulder at the lower end is 1.2 inches in diameter and 0.24 inch thick. The hexagonal nuts are 1.23 inch on a side and .32 inch thick. Both the pins and nuts should also be covered with black varnish.

Figure 4 also shows the manner in which the pins are fastened to the cross arms.

The sockets or stone blocks which are used in order to make the base of the pole firm and secure, are of solid and fine grained granite. They are 4 feet 2 inches high and their section forms a square of 17.7 inches on a side, as indicated in figure 3.

They are cut away at the top to a depth of about 3.9 inches, and the square reduced to 13.78 inches on a side. The upper surface has a slight inclination of about 1.2 inch between two opposite angles. In the middle of the upper face a hole is drilled 9.8 inches



deep and shaped like a section of the pole, that is, like a double T, as indicated by the dotted line in figure 4. This is exactly in the vertical axis of the granite block and its outline conforms as much as possible to that of the poles, so that when the latter are introduced a great quantity of cement will be required in order to secure them firmly.

For securing the poles in the granite blocks, the Bavarian Administration makes use of melted lead as the other substances generally employed for this purpose are liable to give way owing to the continual vibrations of the poles.

The melted lead is poured into the spaces between the pole and sides of the socket until it runs over and forms a pyramid around the base, entirely covering the opening of the stone.

After having been set the poles and cross-arms are covered, especially at the base, with a thick coating of oil varnish of gray zinc, and, in order to prevent discharges of atmospheric electricity from injuring the stone sockets, each pole is provided with a No. 9 iron wire, one end of which is buried in the earth and the other end embedded in the mass of lead which surrounds the base of the pole.

The plan of construction just described is that which is employed for the line between Munich and Augsburg, a distance of 8½ geographical miles; this is the only line on which this system of poles has as yet, been introduced.

This line has been built three years and has thus far required no repairs except the replacing of two of the stone blocks, which already had cracks in them before setting, although these were not then apparent. The insulation is perfect, and the leakages between conducting wires, which interfere particularly with the transmission of correspondence by the Hughes apparatus, are entirely avoided by the use of these poles. In this respect they seem to fulfil the office of large condensers.

The present very high price of iron will doubtless prove an obstacle to the use of this system of metallic poles on all the lines, but the Bavarian Administration considers that if the prospect of this considerable expense is such as to be likely to cause much hesitation on the part of telegraphic administrations, the railroad companies will soon become convinced that it is better to increase the first cost of their railway, in order to obtain a good, substantial telegraph line, than it is to continue to employ wooden poles when their many disadvantages continually compromise the security of trains.

The two following tables indicate, in kilogrammes and francs, the weight and price of the dimensions of iron poles which have been adopted.

TABLE—SHOWING THE WEIGHTS OF THE 5 METRE POLE.

Number of Pieces.	Names of Parts.	Weight in Lbs.	
		Alone.	Together.
Forged Iron.			
1	Pole, 5 metres long.....	181.9	181.9
2	Cross-arms, 2 feet 7 inches long.....	7	14
2	“ 3 “ 6 “ .....	9.7	19.4
1	“ 4 “ 6 “ .....	12.35	12.35
5	Bolts.....		1.65
16	Insulator Pins complete.....		9.9
			239.2
	The weight of a 6 metre pole is.....		276.7
	The weight of a 7 metre pole is.....		312.1
1	Granite Socket.....		1448.4

TABLE—SHOWING THE COST OF A 5 METRE POLE.

Quantity.	Names of Parts.	Cost by the 110½ lb.	Total Cost.	
			Per Piece.	Together.
1 Piece.	Granite block with hole....			\$3 52
181.9 lbs.	Pole of rolled iron.....	\$3 12		5 16
45½ lbs.	Cross-arms of rolled iron...	3 12	\$1 30	1 50
5 Pieces.	Bolts .....	04	29	97.5
16 "	Insulator pins complete....	06		1 17
22 lbs.	Of lead for fastening the poles in stone.....	11.7		
	Painting of poles.....			31
	Total.....			12 65
	The net cost of the 6 metre poles is.....			13 65
	That of the 7 metre.....			14 66

The poles weigh about 36 pounds per meter and carry 16 wires of about No. 7 gauge. The Bavarian Administration considers that for spans of only 145 feet, poles weighing but 22 pounds to the metre might be used. It was thought advisable, however not to reduce the material to its least dimensions for this line, which in reality, constituted an experimental one.

Along railroads the poles most in use are those of 5 meters (16 feet 4 inches) in length, but for level crossings, they are 7 meters (22 feet 10 inches) high, and both sides of the cross-arms for 6 meter poles, are used. On straight lines and for curves on level ground, the distance between the poles is about 145 feet.

#### BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The inaugural address of the President of the British Association for the Advancement of Science, Sir John Hawkshaw, at the meeting held at Bristol, England, August 25, 1875, contains the following in relation to telegraphy:

There is no more remarkable instance of the rapid utilization of what was in the first instance regarded by most men as a mere scientific idea, than the adoption and extension of the electric telegraph.

Those who read Odier's letter written in 1773, in which he made known his idea of a telegraph which would enable the inhabitants of Europe to converse with the Emperor of Mogul little thought that in less than a century a conversation between persons at points so far distant would be possible. Still less did those who saw in the following year messages sent from one room to another by Lesage in the presence of Friedrich of Prussia, realize that they had before them the germ of one of the most extraordinary inventions among the many that will render this century famous.

I should weary you were I to follow the slow steps by which the electric telegraph of to-day was brought to its present state of efficiency. In the present century few years have passed without new workers appearing in the field; some whose object was to utilize the new-found power for the benefit of mankind, others—and their work was not the least important in the end—whose object was to investigate magnetism and electrical phenomena as presenting scientific problems still unsolved. Galvani, Volta, Oersted, Arago, Sturgeon, and Faraday, by their labors, helped to make known the elements which rendered it possible to construct the electric telegraph. With the battery, the electric coil, and the electro-magnet, the

elements were complete, and it only remained for Sir Charles Wheatstone and others to combine them in a useful and practically valuable form. The inventions of Alexander Steinheil, and those of similar nature to that of Sir Charles Wheatstone, were made known at a later date in the same year, which will ever be memorable in the annals of telegraphy.\*

The first useful telegraph was constructed upon the Blackwall Railway in 1838, Messrs. Wheatstone's and Cooke's instruments being employed. From that time to this the progress of the electric telegraph has been so rapid, that at the present time, including land lines and submarine cables, there are in use in different parts of the world not less than 400,000 miles of telegraph.

Among the numerous inventions of late years, the automatic telegraph of Mr. Alexander Bain, of Dr. Werner Siemens, and of Sir Charles Wheatstone, are especially worthy of notice. Mr. Bain's machine is chiefly used in the United States, that of Dr. Werner Siemens in Germany. In this country the machine invented by Sir Charles Wheatstone, to whom telegraphy owes so much, is chiefly employed. By his machine, after the message has been punched out in a paper ribbon by one machine on a system analogous to the dot and dash of Morse, the sequence of the currents requisite to transmit the message along the wire is automatically determined in a second machine by this perforated ribbon. The second operation is analogous to that by which in Jacquard's loom the motion of the threads requisite to produce the pattern is determined by perforated cards. By Wheatstone's machine errors inseparable from manual labor are avoided; and what is of even more importance in a commercial point of view, the time during which the wire is occupied in the transmission of a message is considerably diminished.

By the application of these automatic systems to telegraphy, the speed of transmission has been wonderfully accelerated, being equal to 200 words a minute, that is, faster than a shorthand writer can transcribe; and, in fact, words can now be passed along the wires of the land lines with a velocity greater than can be dealt with by the human agency at either end.

Owing partly to the retarding effects of induction and other causes, the speed of transmission by long submarine cables is smaller. With the cable of 1858 only 2½ words per minute were got through. The average with the Atlantic cable, Dr. C. W. Siemens informs me, is now 17 words, but 24 words per minute can be read.

One of the most striking phenomena in telegraphy is that known as the duplex system, which enables messages to be sent from each end of the same wire at the same time. This simultaneous transmission from both ends of a wire was proposed in the early days of telegraphy, but, owing to imperfect insulation, was not then found to be practicable; but since then telegraphic wires have been better insulated, and the system is now becoming of great utility, as it nearly doubles the capacity for work of every wire.

And yet within how short a period of time has all the wonderful progress in telegraphy been achieved! How incredulous the world a few years ago would have been if then told of the marvels which in so short a space of time were to be accomplished by its agency!

It is not long ago—1823—that Mr., now Sir Francis Ronalds, one of the early pioneers in this field of science, published a description of an electric telegraph. He communicated his views to Lord Melville, and that nobleman was obliging enough to reply that the subject should be inquired into; but before the

\* Dates of patents: Wheatstone, March 1, 1837; Alexander, April 22, 1837; Steinheil, July 1, 1837; Morse, October, 1837.

nature of Sir Francis Ronald's suggestion could be known, except to a few, that gentleman received a reply from Mr. Barrow, "that telegraphs of any kind were then wholly unnecessary, and that no other than the one then in use would be adopted;" the one then in use being the old semaphore, which, crowning the tops of the hills between London and Portsmouth, seemed perfection to the Admiralty of that day.

I am acquainted with some who, when the first Transatlantic cable was proposed, contributed toward that undertaking with the consciousness that it was only an experiment, and that subscribing to it was much the same thing as throwing their money into the sea. Much of this cable was lost in the first attempt to lay it; but its promoters, nothing daunted, made 900 miles more cable, and finally laid it successfully in the following year, 1858.

The telegraphic system of the world comprises almost a complete girdle round the earth; and it is probable that the missing link will be supplied by a cable between San Francisco in California and Yokohama in Japan.

How resolute and courageous those who engaged in submarine telegraphy have been will appear from the fact that, though we have now 50,000 miles of cable in use, to get at this result nearly 70,000 miles were constructed and laid. This large percentage of failure, in the opinion of Dr. C. W. Siemens (to whom I am much indebted for information on this subject), was partly due to the late introduction of testing a cable under water before it is laid, and to the use of too light iron sheathing.

Of immense importance in connection with the subsequent extension of submarine cables have been the discoveries of Ohm and Sir William Thomson, and the knowledge obtained that the resistance in wire of homogenous metal is directly proportional to the length, so that the place of a fault in a cable of many thousand miles in length can be ascertained with so much precision as to enable you to go at once to repair it, although the damaged cable may lie in some thousands of fathoms of water.

#### LIGHTNING RODS.

We published, in our last number, a very interesting communication from Mr. George B. Prescott, the electrician of the Western Union Telegraph Company, concerning an alleged electrical phenomenon, observed during a thunder storm, within a private dwelling, and described by a correspondent in our paper of August 14, 1875.

The phenomenon in question consisted of electrical discharges from the water and gas pipes of the dwelling, which was furnished with a lightning rod. The question was as to the cause of the electrical manifestation. Mr. Prescott believed that it was due to the defective connection of the lightning rod with the earth; but in order to satisfy himself fully in the matter, he took the trouble to send an assistant to the locality, and subject the premises, pipes, and rod to actual electrical tests with the galvanometer.

The result was that the lightning rod was found to be so sadly defective in its ground connection that it could not conduct the electricity into the earth, except feebly; and whenever a thunderstorm occurred, the house became charged with electricity, and the current, being unable to pass down the rod, made its way through the building to the water pipe, and escaped through it into the ground. The details given by Mr. Prescott are quite interesting. He advised the immediate connection of the rod with the water pipe, which would thus serve as an extensive conducting terminal for the rod, ensure the safety of the building, and put an end to the electrical manifestations among the pipes before mentioned.

The case is a representative one, as the rod was put up in the same defective manner as are the majority of rods, that is, the bottom of the rod was simply stuck down a few feet into the ground or rock, and thus practically insulated.

We have repeatedly advised our readers that a lightning rod, in order to serve as a protection for a building, must have a large conducting terminal in the earth. This terminal may consist of an iron water pipe, as in the present case, or a very considerable extension of the rod itself into wet or damp earth; or a trench, filled with iron or charcoal, may be made available.

The aggregate annual losses of life and property in this country, by the striking of buildings by lightning, is immense, but might be almost wholly prevented if properly arranged conductors were generally employed. But it is evident that a more intelligent class of lightning rod men are needed in their erection; and it is probable that electrical instruction must also be given in our common schools before much improvement can be expected.

If a man, employed to put up a tin pipe to conduct the rain water from the roof to the cistern, were to solder up the bottom of the pipe, thus preventing any flow, his work would be rejected, and he would be stigmatized as a fool. But this is substantially what our lightning rod men are doing every day.

They put up rods for the alleged purpose of conducting the electric fluid, but seal or insulate the bottoms of the rods so that the fluid cannot flow into the ground; and the majority of employers are so ignorant of the subject that they are unable to detect the fraud.

The known laws that govern the flow of electricity are almost as simple as those relating to water. If a proper connection exists between the rod and the earth, the building will be protected, for electricity will flow through the rod with the same certainty that water will pass through an open leader from roof to ground. But if the bottom of the pipe be sealed, the water cannot run; but if the bottom of a lightning rod be sealed or insulated, the electricity cannot flow.

Tests of lightning rods with the galvanometer, as directed by Mr. Prescott, will always show whether they are safe or not. But it may be taken for granted, without a test, that a rod is unsafe which merely has its bottom stuck down a few feet into dry earth. We repeat, the golden rule for safety is to have the bottom of the rod placed in connection with a large mass of conducting material in the ground.—*Scientific American*.

#### INTERNATIONAL WEATHER REPORTS.

Gen. Myer, of the Signal Service, has published a bulletin of international meteorological observations taken simultaneously at various stations in Algiers, Austria, Belgium, Great Britain, Sweden, Switzerland, Turkey, Syria, Canada, the United States, France, Germany, Italy, the Netherlands, Norway, Portugal, Spain and Russia. This bulletin sets on foot, for the first time in history, a regular international exchange of weather reports. It is the object of the exchange to render practicable the preparation of a daily weather map, which may embrace within its limits the whole northern hemisphere, and permit a study of atmospheric movements which, not limited to any one continent or sea, may enable storms and disturbances to be traced, from wherever they arise, through their course until they disappear. The limits of any one continent are too small to allow the proper study of the atmosphere which, surrounding the earth, revolves in its whole extent with it once in twenty-four hours. The observations on the bulletin

are taken everywhere at the same instant of physical time. For instance, when the observers at New York and San Francisco are reading their instruments daily, it may be safely assumed those in Siberia or the Pacific, the West Indies or Northern Canada, are at that moment also reading theirs. The readings reported are thus simultaneous and valuable. The bulletin is inexpensive, the readings being taken in every country by the observers of that country, and forwarded by mail to Washington, in packages, on the 15th and last days of each month; the United States observations being sent as an equivalent. Distinguished meteorologists have approved the undertaking. The Congress in Vienna, in 1873, having given it their approval, it has fallen to the United States, to be the first to give the work practical shape, and to establish a form which aims to bind together, in a work for a common good, the labors of every country.

RESEARCHES ON THE PHENOMENA PRODUCED BY ELECTRIC CURRENTS OF HIGH POTENTIAL, AND ON THEIR ANALOGIES WITH NATURAL PHENOMENA.—*M. G. Plante*.—Having employed as voltmeter a U-tube full of salt water, and submitted it to the action of the electric source indicated in a former communication, the author observed the following phenomena. If, the negative wire being plunged in one of the limbs of the tubes the end of the positive wire is placed in contact with the glass in the other limb, a little above the liquid, we perceive at first around the wire a glittering crown produced by the saline particles which line the tube. If the wire is approached towards the liquid a depression is produced; a luminous arch, bordered with radiating striae, appears along the glass, and is transformed into an irregular demicrown with sinuous outline, and animated with a rapid undulatory movement. Steam escapes in rapid jets above the sparks of fire, as if it issued from a boiler under pressure. The concavity of the luminous arch in the voltmeter, turned toward the point whence the positive current issues, compared to the concavity of the aurora turned toward the earth, shows that the flow of the electric currents, brought from the equator by the higher winds is from below upwards, that is, from these regions of the atmosphere to still loftier ones. These currents, impinging upon the icy clouds of the poles, which correspond to the saline particles and to the moist glass of the voltmeter, are transformed into heat and light, and vaporise the polar clouds which are re-precipitated in the foam of snow or rain. Thus the polar aurora is due, not to discharges between the electricity of the atmosphere and that of the ground—which would involve the poles in a perpetual thunderstorm—but rather to the dissemination in the higher atmosphere of the great masses of electricity derived from the surface of the globe in a calorific and luminous form. Finally, if it is permissible to carry out the analogies further, we find in the phenomena observed a reproduction on an infinitely small scale of the possible mode of formation of the heavenly bodies, spherical or annular, and a rapid image of their development down to their extinction or transformation in space. We are thus led to think that in the first impulse given, or in the number of the various movements impressed upon the ethereal matter in the work of creation, it is necessary to include that particular mode of motion which constitutes electricity, masked as it might be under the more striking phenomena of heat and light.

The Duxbury Cable to France is now working as usual.





## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

JULY 1875.

## APPOINTMENTS.

P. J. Wilson, B'way & Dey st.	W. B. Simmes, Dennison, Tex.
H. T. Butler, " "	F. G. Gwynne, Houston, " "
J. M. Foster, " "	Arthur Bell, Longview, Tex.
C. H. Smith, " "	J. S. Buchanan, Minden, La.
J. N. Vynne, " "	G. A. Singer, Monroe, " "
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C. H. Davis, " "	John McCabe, St. Louis, " "
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W. T. Lope, " "	J. B. McClintch, Schuyler, Neb.
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J. H. Dennis, " "	A. H. Lord, Ft. Wayne, Ind.
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T. Horan, 14 Broad st.	J. C. Sewill, " "
T. H. Fisher, Cotto. Exch'go.	F. E. Blackney, " "
B. Deklyn, Corn Exchange.	J. Rudolph, " "
J. R. Eschelman, 50 Ege st.	C. Smith, " "
A. J. Clark, Pier 28 N.Y.	Rich'd Harry, " "
J. Traynor, West Flushing, L.I.	A. D. Campbell, Cleveland, O.
C. F. Dowd, N. Granville, N.Y.	M. S. Greene, " "
J. F. Corbin, Poultney, Vt.	F. D. Lyon, Detroit, Mich.
R. Tallmadge, Coeymans, N.Y.	H. W. Shriver, " "
G. L. Smith, Pearsalls, L. I.	E. W. Crosby, " "
Miss A. F. West, Boston, Mass.	E. Snively, " "
W. P. Weaver, " "	S. E. Watson, " "
T. F. Bishop, " "	S. Burton, Plainwell, " "
John Sheldon, " "	Miss L. Grannis, Jackson, Mich.
Miss L. S. Marshall, " "	E. A. Hoffman, Toledo, O.
A. M. French, " "	C. D. Smith, Uminsville, O.
E. A. Josslyn, " "	C. H. Moore, Ironton, Ohio.
A. G. Coffin, Fall River, " "	H. F. Donnelly, Pomeroy, " "
W. T. Stone, Hartford, Ct.	Miss E. Banks, " "
F. S. Raymond, New London, Ct.	T. H. Badgidge, Washington O. H.
W. A. Hennessy, Newport, R. I.	T. H. Allen, Syracuse, N. Y.
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L. Jones, Springfield, Mass.	W. C. Galloway, Co. Shops, N.C.
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E. A. Boardlee, " "	R. W. Coenahan, Sewell's Point, Va.
F. O. Noble, " "	Geo. W. McKnight, Sweet Water, Tenn.
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J. W. McDonald, Ellershouse, N. S.	J. P. Dickerson, Wytheville, Va.
J. W. Irving, Folloigh Lake, N. S.	W. R. Parry, Yellow Sul. Spgs., Va.
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Miss M. J. Bancroft, Fabyan House, N. H.	A. B. Leiser, Brown's Sta., Ala.
Miss A. F. Howe, Glen House, N. H.	J. A. Githens, Asbury Pk., N. J.
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F. H. Gove, Profile House, N. H.	Miss E. C. Storms, Clinton, N. J.
E. A. Blake, Twin Mountain House, N. H.	M. G. West, Deans, " "
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F. H. Wheeler, White River Junction, " "	M. Miller, Hartsville, " "
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E. H. Holloys, " "	C. W. Digging, Hillsboro, Md.
Miss J. C. Davis, Marshalltown, Ia.	Jacob Cook, Howard, Pa.
D. P. Boyd, Racine, Wis.	A. J. Logan, Jersey City, N. J.
A. W. Jones, Alma, Col.	H. Rudolph, Kennysville, Pa.
J. C. Stanton, Bradford Jct., Col.	M. Smith, Littlestown, Pa.
E. J. Stevenson, Chicago, Ill.	J. R. Pondegrast, Orange Junct., Pa.
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J. M. T. Weller, " "	F. B. Shigley, " "
A. W. Beldier, " "	R. A. Meyers, " "
J. L. Newton, Camden, Ark.	E. D. Morton, " "
	L. W. Mickley, Phoenixville, " "
	S. S. Horning, Telford, " "
	C. L. Willis, Stevenson, Ala.
	B. F. Pilkon, Worthville, Ky.
	Miss F. Chase, Bridgton, Me.
	Miss C. F. Newman, Phillips, Mo.
	B. F. Jones, Strong, Mo.

## RESIGNATIONS.

W. A. Brower, B'way & Dey st.	C. Van Eiten, B'way & Dey st.
H. R. Butler, " "	G. E. Webb, " "
H. Fitchett, " "	W. M. Allison, " "

G. A. Smith, B'way & Dey st.	W. J. Grier, Salt Lake, Utah.
C. Flood, " "	J. J. Fallon, Schuyler, Neb.
F. L. Rector, " "	G. T. Marley, Virginia City, Mt.
F. L. Swann, 791 Broadway, N. Y.	C. E. Seale, Ft. Wayne, Ind.
W. B. Keeler, Grand Central D.	J. F. Henrici, Pittsburgh, Pa.
W. Finley, 14 Broad st.	J. Karbach, Buffalo, N. Y.
G. B. Mason, Cotton Exchange.	E. B. Rew, " "
G. T. Musson, Brooklyn, L. I.	C. Brum, " "
W. A. Dowd, N. Granville, N.Y.	Gall Couch, " "
J. Clarke, Poultney, " "	L. D. Morse, Cleveland, Ohio.
T. C. Slingerland, Coeymans, " "	O. E. Watts, Detroit, Mich.
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D. Mumford, Ellershouse, N. S.	F. D. Lyon, Grand Rapids, Mich.
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John Rutherford, Harvey, N. B.	Miss S. Guannis, Spring Lake, Mich.
W. McDonald, Little Glace Bay.	Wm. Mallett, Syracuse, N. Y.
R. S. Harris, Pt. Du Cheno, N. B.	R. J. Mallett, Sharon Sp., " "
J. E. Eckert, St. John, " "	T. H. Bradley, Alexandria, Va.
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E. S. Dodge, " "	S. H. Weldor, Co. Shops, N. C.
Wm. Armour, " "	W. F. Fountain, Eggmont, " "
Miss F. O. Sawyer, " "	R. F. Ayres, " "
C. E. Davidson, " "	J. G. Cooley, Hillsboro, " "
M. O'Hern, " "	N. Stanley, Kinston, " "
Geo. Wheelock, Fall River, " "	A. B. Bentley, Pleasant Hill, " "
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J. B. Gaynor, " "	H. F. Lines, " "
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W. N. Sperry, " "	W. F. Whitehurst, Sewell's Pt., Va.
J. M. Creamer, Saugatuck, " "	H. S. Bady, Wilmington, N. C.
F. W. Gliddon, Springfield, Mass.	R. K. Bailey, Wytheville, Va.
Miss A. L. Davison, Wallingford, Ct.	John J. Crowley (dead), Savannah, Ga.
Miss S. J. Prouty, Williamsburg, Mass.	C. H. Smith, New Orleans, La.
F. J. Aldrich, Worcester, Mass.	S. W. Bradley, " "
F. B. Farnsworth, Braintree, Vt.	T. J. Woolf, " "
L. M. Bartlett, Littleton, Mass.	W. B. Schieble, Winchester, Miss.
S. W. Weeks, White River Junction, Vt.	A. P. Leiser, Bellevue, Ala.
— Wait, Clinton, Ia.	M. Brannon, Asbury Park, N. J.
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G. W. S. Hurd, Chicago, Ill.	Robert Fulton, Jersey City, N. J.
Wm. Wallace, Jr., " "	W. McMullen, Philadelphia, Pa.
P. J. Tierney, " "	E. D. Morton, " "
E. Parker, " "	A. W. Beldier, " "
Edgar, Alma, Col.	E. W. Fierier, " "
J. H. Dillman, Camden, Ark.	J. Trump, Washington, D. C.
A. V. Carr, Jacksonport, " "	L. Shafter, Chester Heights, Pa.
— Saunders, Longview, Tex.	G. W. Howe, Stevenson, Ala.
S. O. Sevier, Monroe, La.	C. H. Patch, Memphis, Tenn.
W. H. Wooding, St. Joseph, Mo.	J. J. Constantine, Worthville, Ky.
W. J. Crane, Bell Creek, Neb.	

## TRANSFERS.

From.	To.
Lake George.	B'way & Dey st.
West Flushing.	Sea Cliff, L. I.
New York.	Lebanon Spgs., N. Y.
B'way & Dey st.	Saratoga, N. Y.
14 Broad street.	134 Pearl st.
50 Pine street.	Harlem.
Corn Exchange.	66 Gold st.
Fulton Market.	Fulton Market.
Allertons.	Saratoga, N. Y.
B'way & Dey st.	Long Branch.
New York.	Corn Exchange.
14 Broad street.	Long Branch.
B'way & Dey st.	Saratoga, N. Y.
Corn Exchange.	Port Hastings, C. B.
B'way & Dey st.	St. Johns, N. B.
Baddeck, C. B.	
Port Hastings, C. B.	

## FOREIGN ITEMS.

Intelligence has been received by the India Rubber, Gutta Percha and Telegraph Works Company, by telegraph, of the successful laying and completion of their cable between Callao and Islay, in Peru. This section, about 460 miles in length, is the first of a series of cables, with stations at Arica and Iquique in Peru, and Chalderna in Chili, which will place those ports, as well as Lima and Valparaiso, in telegraphic communication with Europe—first, by the Transandine wires and the Brazilian cable system, and ultimately by the Isthmus of Panama, when a cable shall have been laid thence to Callao.

Mr. James A. Brand, the liquidator of the Panama and South Pacific Telegraph Company has given notice that he is prepared to make a return of £1 10s. per share to all shareholders who have paid up £2 10s. per share.

The receipts of the Submarine Telegraph Company for the month of June amounted to £9,376, against £9,188 for the corresponding month last year.

The traffic receipts of the Western and Brazilian Telegraph Company were £10,829 for the five weeks ending July 2.

At a special general meeting of the Western and Brazilian Telegraph Company, held in London, July 29th, a resolution was adopted to increase the capital of the company £48,200, to enable the company to fulfill its obligations under the agreement of May 23, 1873, between the company and the River Plate and the Brazilian Telegraph Company. The authorized capital of the company is now £1,398,200.

A prospectus has been issued by the directors of the Eastern Extension, Australasia and China Telegraph Company, offering 3,200 debentures, amounting altogether to £320,000, at £100 each, and bearing interest at the rate of six per cent. This amount is required to form a loan to Australia with New Zealand. Shareholders are allowed the option of subscribing in the first instance.

The Italian Government has contracted with the firm of Erlanger & Co. for the laying down and maintenance of a submarine cable from the Continent, near Orbetello, to the Island of Sardinia.

Mr. John Pender, M. P., stated at the meeting of the Eastern Telegraph Company, that the Suez and Aden section of the company's cable has improved in insulation by no less than 38 per cent., and the other cables of the company from 45 to 77 per cent. The cables which have been laid the longest have improved the most. All these cables have been laid by the Telegraph Construction and Maintenance Company.

The East India Telegraph Company announce that the bonds falling due on August 10th will be paid off at the Bank of England, as provided for on each bond, and in order to replace them the Board will shortly raise by tender £1,000,000 on 4½ per cent. debentures.

The traffic receipts of the West India and Panama Telegraph Company for the month of April amounted to £4,485, as compared with £2,802 in the corresponding period of 1874.

On the 8th of July last the number of messages passing through the chief London telegraph office was 36,550, and on the 9th, 36,554, being the highest number passing through the office during 24 hours.

The Western and Brazilian Telegraph Company announce that communication by cable is complete to Montevideo, and that telegrams will now be forwarded direct to the River Plate, without transmission by land lines between Brazil and Montevideo, as heretofore.

The report of the Globe Telegraph and Trust Company states that the net revenue for the year, amounted to £158,154, out of which it is proposed to pay a dividend of 3s. per share on the preference shares and 2s. 6d. on the ordinary shares, making, with the former distributions, 6 per cent. for the year on the former and 5 per cent. on the latter, and leaving £9,326 to be carried forward.

The receipts of the Eastern Telegraph Company for the month of July 1875, amounted to £31,419, against £27,247 in the corresponding period of 1874.

The receipts of the Eastern Extension, Australasia, and China Company for the month of July, amounted to £20,225, against £19,641 for the corresponding period of 1874.

The report of the Submarine Telegraph Company for the half year ended June 30th last, states the ordinary receipts at £54,122. This has enabled the directors to declare a dividend at the rate of 15½ per cent., and to add £2,251 to reserve, carrying £325 forward. A sum of £12,552, obtained from the Post office, has been nearly all spent in laying twenty miles of new cable between Boiling Gap and Dieppe.

# Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

## TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, SEPTEMBER 15, 1875.

At a meeting of the Board of Directors of the Western Union Telegraph Company, held on Friday, September 10th, the regular quarterly dividend of two per cent, from the net earnings of the three months ending September 30th, was declared, and the same made payable on October 15th next to stockholders of record at the close of business on September 20th. It was also provided that for the purpose of the annual meeting of Stockholders for the election of Directors and the transaction of such other business as may be properly considered, to be held on Wednesday October 13th, the books of the Company be closed at 3 P. M. of 20th inst, and be opened on the morning of October 16th.

The President submitted a statement, partly estimated, showing that the net earnings for the present quarter amount to about \$900,000, which is about \$200,000 in excess of the amount required to meet the dividend.

On and after to-day, the rate per word to Great Britain, Ireland, and France, will be twenty-five cents from all points in Nova Scotia, New Brunswick, the New England States, New York, New Jersey, Pennsylvania, Delaware, Maryland and District of Columbia. Thirty-five cents from all points in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan and Wisconsin, from St. Louis, Mo., and the Western Union Company's offices in Florida. Fifty cents from all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dacotah, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada California, Arizona, Oregon, and Washington Territory. Sixty cents from all points in British Columbia. These rates are in gold.

The system of cables via the West Indies, connecting South America directly with the United States, is now complete and open to the public. There are now two routes of telegraphic communication with South America, the other being via the Atlantic and the Brazilian cables.

## IRON TELEGRAPH POLES.

The question of the substitution of iron poles for wooden ones in the construction of telegraphic lines, has never, so far as we are aware, formed a very prominent subject of discussion among American telegraphers. In fact, it is not until within a few years, comparatively speaking, that any considerable proportion of the telegraphic structures throughout the length and breadth of the United States have been entitled to be looked upon as anything better than temporary make-shifts. Fifteen or twenty years ago, the telegraphic system of the country was made up of lines owned by a great number of independent organizations. Most of these lines had been originally built by contractors, without the slightest reference to stability, permanence, or future economy of maintenance. The inevitable result followed. The cost of continual repairs and reconstruction, together with the loss of business from frequent and prolonged interruptions, in most cases, absorbed the entire revenues of the companies.

It was not until the process of consolidation among these feeble and unremunerative organizations had proceeded so far that the whole telegraphic business of the country had become concentrated in the hands of some half-dozen companies, that anything resembling a permanent system of telegraphic construction was undertaken. The small poles of inferior and unseasoned timber began to be replaced by substantial and durable ones of chestnut and cedar, firmly set in the ground; and in this way the average length of time that a line would last without reconstruction was increased from four or five to ten or twelve years, while at the same time the expense of repairs was diminished in even a greater proportion. Under these improved conditions, the telegraph became for the first time in its history, a remunerative investment, and it is now generally recognized by telegraphic managers, that thoroughly well constructed and permanent lines, are the first and most essential requisite of financial prosperity.

In view of these results, it is not strange that many persons should be led to consider that a still further advance in the same direction, that of substituting iron poles, the duration of which would apparently be very great, for the wooden ones now in use, would be a desideratum, in telegraphic construction, and in the end, result in as great a comparative saving, as did the substitution of the more costly wooden poles of the present day for the cheap and inferior ones of former years.

We publish in the present number of the JOURNAL an illustrated description of some of the designs for iron poles which have been employed abroad in actual practice and with satisfactory results. These designs may be regarded as typical of radically different methods of construction. The Siemens pole, which has been far more extensively used than any other, owing to its peculiar adaptation to the conditions met with in a certain class of lines, weighs but little in proportion to its strength, and is, therefore very portable. It can be carried almost any-

where, and set up by the rudest and most unskilled laborers.

The design which has been adopted by the Bavarian Government, is radically different in almost every respect, and while it would be almost useless in many situations for which the Siemens pole is peculiarly well suited, it is apparently better adapted to the requirements of a civilized country, where a large and constantly increasing number of wires must be provided for. The Swiss pole may be regarded as a compromise between the two systems just referred to, and although, perhaps, well enough suited to the necessities of the service in the country where it originated, would scarcely answer as well under other conditions.

The use of iron poles, in this or any other country, may be said to be practically a mere question of dollars and cents, and whether it would or would not be economical in any particular instance, is a matter which must always depend largely upon circumstances. This being the case, it may be worth while to consider whether there there would be likely to be any practical advantage in the use of iron poles in this country, under the conditions which have thus far existed here and which continue to exist at the present time.

If there were any place where the use of iron poles would seem likely to be economical it would be on the lines crossing the plains between the Missouri river and the Rocky Mountains. The cedar poles used in this region cost about one dollar each in Chicago, and the transportation, perhaps, two dollars additional. The cost of setting them might perhaps amount to fifty cents each, making a total cost, when erected, of \$3.50 per pole. If we assume the average life of these poles to be twelve years, which seems to be a very reasonable estimate, we may suppose four sets of poles to last fifty years; at the end of that time the total expense per pole will have been \$14.00.

A Siemens iron pole of corresponding strength and capacity costs, in England, not less than \$6.50. In this country a similar pole, either imported or of home manufacture, would cost, delivered at the place mentioned, and erected, at least \$10. The difference in first cost between this and the wooden pole (\$6.50) if put at simple interest at the rate of seven per cent. for fifty years and added to the original cost of the iron pole, would amount to \$32.75 as against \$14.00 for the renewal of the wooden poles, during the same period.

Take as another example, the 40 foot poles used in New York city. If these are of chestnut, they will cost, at present prices, say \$8.00 each, and the expense of erecting them will average about \$10.00 more, so that when in place they will cost, including painting, etc., say \$20.00. Such poles will carry 25 wires and may be depended on to last twelve years. The transferring of the wires from old poles to new, would not cost at the outside, over \$10 per mile for each wire, or 25 cents per pole per wire, which would be \$8.75 per pole for the 35 wires. The account for fifty years would therefore stand something like this:



Cost of original wooden poles and three renewals.....	\$80.00
Cost of transferring wires three times.....	26.25
Total.....	\$106.25

Now, even if an iron pole, equal in capacity to the wooden one, could be furnished and put in position at a cost not more than twice that of the latter, the simple interest on the extra first cost of the iron pole over the wooden one would have brought its cost up to \$110, or a little more than the expense of the latter, for the period of fifty years, including the necessary renewals.

Thus it would appear that so long as the relative cost of wooden and iron poles in this country continues to be in a proportion of more than two to one in favor of the former, there will be no economy in the employment of iron poles, even if we merely calculate simple interest at the current rate on the extra investment of capital, but it would be quite legitimate to compound the interest, in which case the relative economy of the wooden poles would be even more apparent.

It may be said that at the end of the fifty years the wooden poles would need still another renewal, while the iron ones would continue to be in perfect condition. This latter assumption is open to question, as there are, so far as we are aware, no data by which the actual life of an iron pole can be determined. If, however, we even go so far as to assume that the iron poles will last forever, without deterioration, the wooden poles would still be the cheapest, so long as the difference in cost between them and the iron poles amounted to a sum, the interest of which during the lifetime of the wooden pole, would be more than sufficient to pay for the renewal of the latter.

#### ELECTRO-HARMONIC SYSTEM OF MULTIPLE TRANSMISSION.

During the past two weeks, Mr. Elisha Gray of Chicago, Ill., has been exhibiting his Electro-Harmonic apparatus in the Western Union Building, in this city. More than a year since we published an article descriptive of this curious discovery, so far as it had been developed at that time. Since then Mr. Gray has devoted the greater part of his time to the perfection of the apparatus, and has already succeeded in producing some very remarkable results. Mr. Gray's earlier experiments disclosed the fact that composite tones were as easily transmitted over a wire as single notes, and from this discovery he developed a system of multiple transmission, founded on this principle. The apparatus was tested experimentally on a wire between Boston and New York, on last Saturday with very satisfactory results. Four separate communications were simultaneously transmitted from Boston and copied from four sounders by a like number of receiving operators in New York. In the main the signals were perfectly received on all the instruments, the only apparent defect being a tendency to shorten them somewhat, a difficulty which can doubtless be overcome by a suitable modification of the transmitting apparatus.

The principle of the apparatus is a very simple

one. The depression of each key sets a self-vibrating electrotome in operation, which is adjusted or tuned to vibrate at a certain rate, differing from that of any of the others, when under the influence of the electro-magnet controlled by its corresponding key. These several sets of electrical vibrations are transmitted through the circuit without interfering with each other, in the same manner that almost any number of different sets of sound waves may pass through the air without mingling. At the receiving station, each instrument is so adjusted as to respond to its own special sets of waves or vibrations without regard to others. By breaking and closing the circuit upon the transmitting electrotome, so as to form telegraphic signals, these are transmitted and taken up by the corresponding receiving apparatus.

It is not easy to fix a limit to the number of different communications that may be carried on over the same wire simultaneously, either in the same or opposite directions. The marked success which attended the operation of the principle through two hundred and forty miles of line, on Saturday, seems to promise results in the future of the greatest value.

#### EMPLOYEE'S BONDS.

It will be seen by the action of the Executive Committee of the Western Union Telegraph Company as hereinafter stated, that the Company has determined to require the amplest security wherever trust is reposed. It has, therefore, devolved on Vice-President Cornell, under authority of the President, the duty of preparing a form of bond which shall give the guarantee which the Executive Committee of the Company directs to be obtained, and to require their execution by the parties indicated with the least reasonable delay. It is unnecessary to say that the altered circumstances of the Company, its increased and increasing business, and the constantly enlarging availment by the public of the money transfer service department, by which large sums of money are not unfrequently placed in the hands of office managers and others, renders this action necessary. A very large number of office managers have already and for years past given such bonds, but the form has been deemed unsatisfactory, and the practice has not been as thorough and universal as it is now determined to make it. We give the Executive Order now to prepare parties for compliance with the demand which will probably soon be made upon them and to save unnecessary embarrassment. Full directions will be issued through the General Superintendents in due season.

The following is the action taken by the Committee:

*First*—Every employé liable to have in hand over \$500 in any one month shall be required to execute bond with responsible security in double the largest amount he is liable to have in hand at any one time.

*Second*—The form of bond shall be full and broad, indemnifying against default of the employé and any subordinate under him who shall be permitted by him to handle the Company's funds.

*Third*—It shall be the duty of the District Superintendent to take such bonds and to know and report the sufficiency of the sureties to the General Superintendent, who shall pass upon and approve the bonds and hand them over to the President, or such Executive officer as he shall designate, for being further examined, entered upon a docket book and turned over to the Treasurer for preservation.

*Fourth*—The President shall designate a competent person to examine all existing bonds as to their sufficiency in form and security, and cause the same to be classified and enlisted on a book. Present employes of the class designated who have no sufficient bonds on file shall be required to comply with the rule without delay.

*Fifth*—The President shall from time to time designate one or more competent accountants as private inspectors to visit without notice the larger offices of District Superintendents and Managers and examine their accounts and balances and report thereon.

*Sixth*—No office shall allow more than \$600 to accumulate and be retained longer than 24 hours. In the middle class of offices, not making daily deposits, whenever there are as much as \$600 on hand, at least \$500 shall be at once remitted to the Treasurer except in such cases as the Treasurer shall otherwise instruct.

*Seventh*—Any employé keeping an official book account shall notify and obtain the approval of the Treasurer as to the bank in which his account is kept; and such bank shall be requested in case of any overdrafts to send notice thereof directly to the Treasurer by telegraph.

#### Business Notices.

I have recently obtained from George H. Bliss & Co., a helix, made by the Western Electric Manufacturing Company, No. 220 Kinzie Street Chicago, Ill., which affords great satisfaction. It is capable of delicate graduation of the strength of the faradic current so as to be effectual, and yet not too strong to be pleasant, with a fineness of interruption that prevents the feeling of distinct shocks, this being an important condition for the best tonic effects of faradisation. *David Prince, M. D., in REPORT ON GALVANO-THERAPEUTICS, made to the Ill. State Med. Soc., 1875.*

The finest dwelling house in Chicago and the most elegantly furnished, is said to be that of Mr. Daniel Thompson, the elevator proprietor, located at Peoria avenue and 20th street. Mr. Thompson is now having his house fitted up with Electric Annunciators, Burglar Alarms, Call Bells, etc. From the fact of his employing the Western Electric Manufacturing Company to do this work it follows, as a matter of course that it will correspond in style with the other appointments of his house.

The great success of Bunnell's specialties, Learners' Instruments, Giant Sounders, pocket relays, etc., would seem to prove their superiority, in every respect, over other instruments. Messrs. L. G. Tillotson & Co. have made great reduction in the prices of these specialties which they manufacture in superb style.

Headquarters for Telegraph Instruments, supplies, wire, batteries, etc., is still at 8 Dey street, New York, where L. G. Tillotson & Co., with an immense first class stock of everything connected with a telegraph line, continue to supply orders from all parts of the world.

Any one who wishes to learn telegraphy should get a copy of Smith's Manual. It is one of the best works on the subject ever published and contains much practical information which is not printed in any other book. This last edition is more full than any which has preceded it. See advertisement.

## A DANISH MULTIPLEX.

The *Golos* announced the arrival at St. Petersburg of M. La Cour, assistant director of the Copenhagen Physical Observatory, in order to submit to the telegraphic conference a new invention in telegraphy. That invention gives the possibility of transmitting dispatches between two telegraphic stations through one wire only, and by means of many instruments, so that transmission by one instrument cannot impede the action of the other. M. La Cour, whilst engaged some years ago in investigating a passage of electric currents through conducting media, found that electricity is transmitted from place to place by undulations analogous to those of sound. In consequence of this discovery, he hit upon an arrangement of electro-magnets and tuning-forks, by means of which a particular current passing through a tuning-fork pitched to a certain note does not become merged in or confounded with other currents which, after passing through differently pitched tuning-forks are simultaneously transmitted along the same wire. This, of course, renders it possible to send many messages at a time through a single wire.

## THE LECLANCHE BATTERY.



(PATENTED.)

The ONLY one which is perfectly suitable for ALL OPEN CIRCUIT WORK such as ELECTRIC BELL RINGING, HOTEL and HOUSE ANNUNCIATORS, BURGLAR ALARMS, SIGNALS, LABORATORY EXPERIMENTS, Etc.

or wherever a battery is wanted which is CLEAN, FREE FROM ACIDS,

ALWAYS READY FOR USE, and

DOES NOT CONSUME WHEN NOT IN OPERATION.

It lasts, without renewal, from six months to several years, according to use. It does not freeze, emits no odor whatever, and does not get out of order.

For these reasons it is the only suitable and safe battery for bells, etc., in private houses where the battery must be clean, reliable and always ready for use.

The electro-motive power of Grove being 100, this is 75, and Daniells 50; or three cells of this battery are equal to four cells of the Daniells.

Liberal discounts to the trade. For circulars, prices, etc., send to

**The LECLANCHE Battery Co.**

No. 40 West 18th Street.

Or to **L. G. TILLOTSON & CO.,**

Sole Agents,

No. 8 Dey Street.

**PHILADELPHIA:** 54 South Fourth Street.

**CINCINNATI:** 22 West Fourth Street.

**\$5 to \$20** per day at home. Samples worth \$1 free. STINSON & Co., Portland, Maine.

**\$12 a day** at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

## GLASS CARDS

RED, BLUE, WHITE

Clear and Transparent.

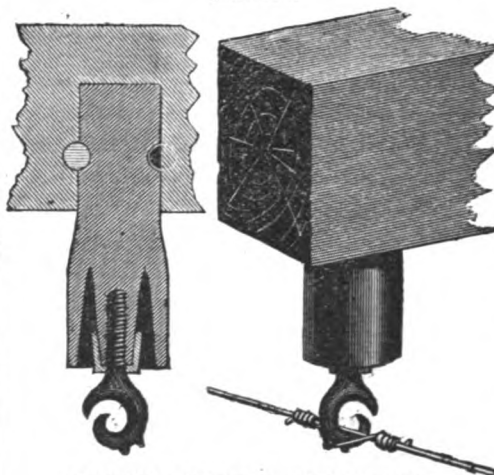
Your Name Beautifully

printed in GOLD on 1

dozen for 50c. post paid, 3 doz. \$1. Must have Agents Everywhere. Outfits, 25c. Samples 10c. F. K. Smith & Co. Bangor, Me.

## THE KENOSHA INSULATOR Co.

Telegraph Companies and Telegraph Constructors are invited to examine the merits of our new and improved patterns of



## KENOSHA CARBON INSULATORS!

These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellant of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of SIX YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average, MORE THAN TEN TIMES AS GREAT

during the prevalence of rain or fog.

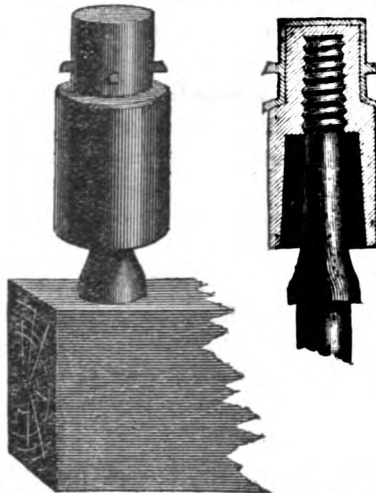
Immense numbers of these Insulators are in use by

The North Western Telegraph Co.,

The Western Union Telegraph Co., as well as many RAILWAY and OTHER TELEGRAPH LINES, and they have invariably been found to give

## ENTIRE SATISFACTION.

Besides the Suspension Insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



## CAP INSULATOR, WITH PIN OR BRACKET,

which is fitted with a zinc protection, as shown in the above figure,

## THE KENOSHA INSULATOR

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice,

CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.

These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all insulators furnished by us to prove entirely satisfactory.

## THE KENOSHA INSULATOR CO.,

KENOSHA, WIS.

**L. G. TILLOTSON & CO.,**

8 Dey St., New York,

GENERAL EASTERN AGENTS.

**THE WESTERN ELECTRIC MFG. CO.,** of Chicago,

GENERAL WESTERN AGENTS.

## The Telegraphers' Mutual Benefit Association.

ESTABLISHED OCTOBER 22, 1867.

Its object is to Aid the Families of Deceased Members

BY PAYMENT TO THE HEIRS OF \$1,000.

Any person who is, or who has been, employed in telegraph service in any capacity, may become a member of this Association upon giving proof of good health and habits, and payment of the required fees.

**INITIATION FEE, \$2.00.**

Payments required: One Dollar upon the Death of each Member.

Application blanks, copies of the By-Laws, and other information furnished upon application to the Secretary, or any of the Agents.

The attention of former members of the Association is called to the following resolution, passed at the last Annual Meeting of the Association:

RESOLVED, That delinquent members shall be eligible to renewed membership on payment of back dues to an amount NOT EXCEEDING FIVE DOLLARS, and without further initiation fee.

W. HOLMES, Secretary.

J. D. REID, Treasurer.

Box 3175, New York.

N. B.—Members will please note change in number of Post Office Box.

Photographs and stereoscopic views of the operating room and switch of the New York Office have been taken and will be sold for the benefit of the Telegraphers' Mutual Benefit Association.

## REDUCED PRICES AS FOLLOWS:

Operating Room, 10x14 inches.....\$1.25  
" " 8x10 " ..... .75  
Switch, 8x10..... .75

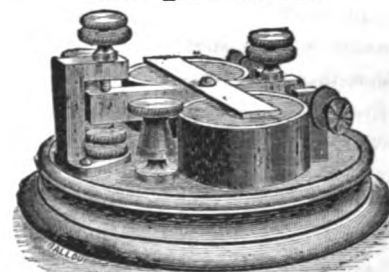
## STEREOSCOPIC VIEWS.

Operating Room..... .35  
Switch..... .35

Address orders for any of the above to the Secretary of the Association.

## LITTLE MONITOR

Improved.



PRICE, \$6.00.

THE FINEST SOUNDER MADE.

THOUSANDS IN USE.

THEY SELL THEMSELVES.

Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful little Sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. PRICE, \$4.00.

No cast or malleable iron used in these instruments.

Sounder and Key, together. \$9.00.

Orders filled promptly and sent on receipt of price, or C. O. D., if 10 per cent. accompanies the order.

**M. A. Buell & Sons,**

86 Bank Street, Cleveland, O.



WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, July 2d, 1875.

This Company is now prepared to pay the principal and accrued interest of its Bonds, maturing November 1st, 1875, upon delivery of the Bonds at this office.

R. H. ROCHESTER, Treas.

**WANTED**—BY YOUNG MAN, A FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 140, Janesville, Wis.



## OPERATORS' CHANCE!

ELECTROTYPE Cards of Key, Sounder and Relay, with your name printed in handsome type on 25 extra fine Bristol, white and tinted, for 25c., or 50, with business and address, for 50c. Samples, 3c. Railroad Operators send 10cents extra for conductor's and brakemen's electrotypes cards. You can make money. Agents outfits, with the handsomest and most stylish cards printed, for 25c. Address, F. P. MUNN, Clyde, Wayne County, N. Y.

## ORTON'S PATENT PENCIL HOLDER.

This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS:

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 10 cents each. Sent by mail on receipt of price.  
Price per dozen, - - - 60 cents.

GEO. H. BLISS & CO.,

CHICAGO, ILL.

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This Company furnish

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As manufacturers of all the perfect TELEGRAPHIC PRINTING INSTRUMENTS in use, and owners of a large number of Patents, we are prepared, under the facilities of our contracts with the WESTERN UNION TELEGRAPH CO., to extend our system of COMMERCIAL REPORTS and PRIVATE LINES to all parts of the UNITED STATES.

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AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES. Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their Business, domestic and foreign, enabling them to keep pace with telegraphic progress. They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

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FOR

Partrick & Carter's Instruments.

NEW PERFECTED GIANT SOUNDERS,

IMPROVED CURVED KEYS, LATEST AND BEST,

CHAMPION LEARNERS' INSTRUMENTS,

SPLENDID NEW POCKET RELAYS, AND

REGULAR RELAYS.

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## The "Snapper" Sounder.



PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

PRICE 75 CENTS.



Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

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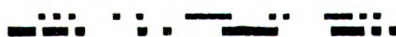
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Weekly Mail Steamship service between  
PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.

The following Steamers are appointed to sail from  
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PENNSYLVANIA.....Sept. 16 | OHIO.....Oct. 7  
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\*CITY OF BRISTOL.....Sept. 30 | \*KENILWORTH.....Oct. 21

PRICES OF PASSAGE IN CURRENCY.

Cabin, \$100.

Steerage and intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate. Passenger accommodations for all classes unsurpassed. For passage, rates of freight and other information apply to

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Appointed to carry the Belgian and United States Mail.

The following Steamers are appointed to sail

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From Philadelphia.

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For New York.

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## Orton's Patent Awl Clip.

These Clips have been in practical use for three years, and are rapidly displacing all others.

They are designed for holding messages and every form blanks.

For convenience, durability and economy they are passed.

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## ORTON'S

## Patent Security Message Hook.

The damage resulting from the loss of a single message frequently sufficient to equip a line many times with hook. Papers cannot be blown or carelessly crowded from

These Hooks were first introduced by Geo. H. Bliss & Co.

Thousands of them are in use in telegraph offices, b and counting rooms.

PRICE 30 CENTS EACH, or \$3.00 PER DOZEN.

Liberal terms to the trade.

WESTERN ELECTRIC MFG. CO.

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## AMERICAN FIRE ALARM.

AND  
POLICE TELEGRAPH.

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ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,

San Francisco, Cal., Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

## AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM RELIABILITY:

Albany, N. Y.	New Orleans, La.
Alleghany, Pa.	New Haven, Conn.
Boston, Mass.	Newark, N. J.
Buffalo, N. Y.	Omaha, Nebraska.
Baltimore, Md.	Philadelphia, Pa.
Chicago, Ill.	Pittsburg, Pa.
Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass.	Quebec, L. I.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
Dayton, Ohio.	Indianapolis, Ind.
Elizabeth, N. J.	St. Louis, Mo.
Fall River, Mass.	St. John, N. B.
Fitchburg, Mass.	Springfield, Mass.
Hartford, Conn.	San Francisco, Cal.
Jersey City, N. J.	Savannah, Ga.
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The distinctive features of these systems of

## FIRE ALARM AND POLICE TELEGRAPHS

## ARE

*First*—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables anyone—even a child—to give an *instantaneous, general and definite* alarm of fire.

*Second*—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchmen.

*Third*—The ELECTRO-MECCHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

*Fourth*—The ELECTRO-MECCHANICAL GONG STRIKER, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

*These features combined form the*

## ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM

## OF

## [FIRE ALARM TELEGRAPH IN THE WORLD.]

Messrs. GAMEWELL & CO. are the owners of the original *FARMER AND CHANNING PATENTS*, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

## MORE THAN TWENTY PATENTS.

The introduction and operation of the  
AUTOMATIC SYSTEM

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

*The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.*

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

## THE WESTERN ELECTRIC MANUFACTURING CO.

220 KINZIE STREET, CHICAGO, ILL.

WE KEEP IN STOCK THE FOLLOWING ARTICLES:

GALVANIZED WIRE,  
COMPOUND WIRE,  
SCREW GLASS INSULATORS,

(Cauvet's Patent).

BRACKETS, PINS, SPIKES,  
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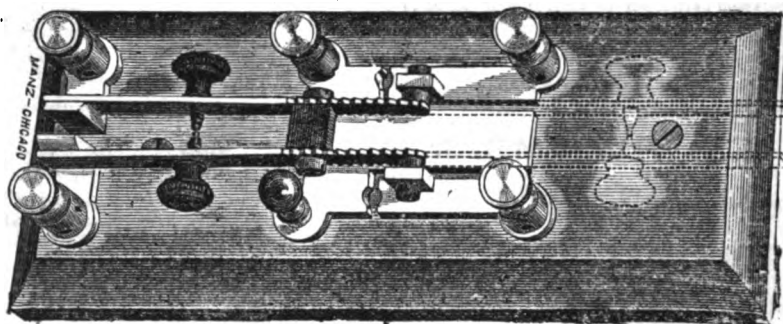
DANIELL BATTERY,

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CUT-OUTS, (new style),

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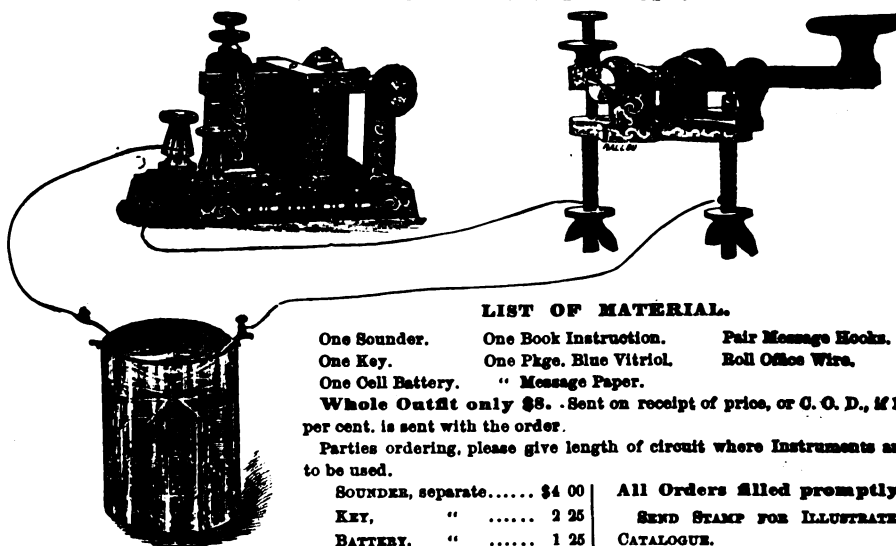
INDUCTION COILS,

ALARM BELLS,

Our Morse Instruments are of the Western Union, Ottawa (or Caton) style. We have ample facilities for the execution of every variety of electrical work.

## THE EUREKA INSTRUMENT.

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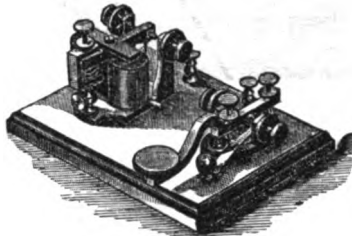
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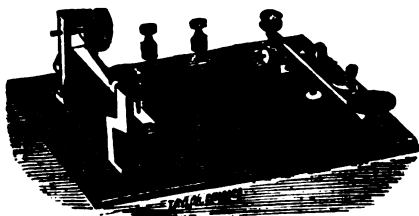
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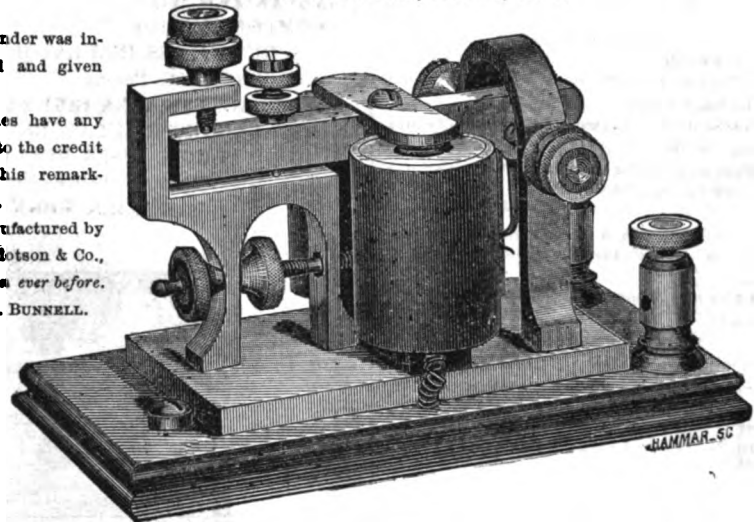
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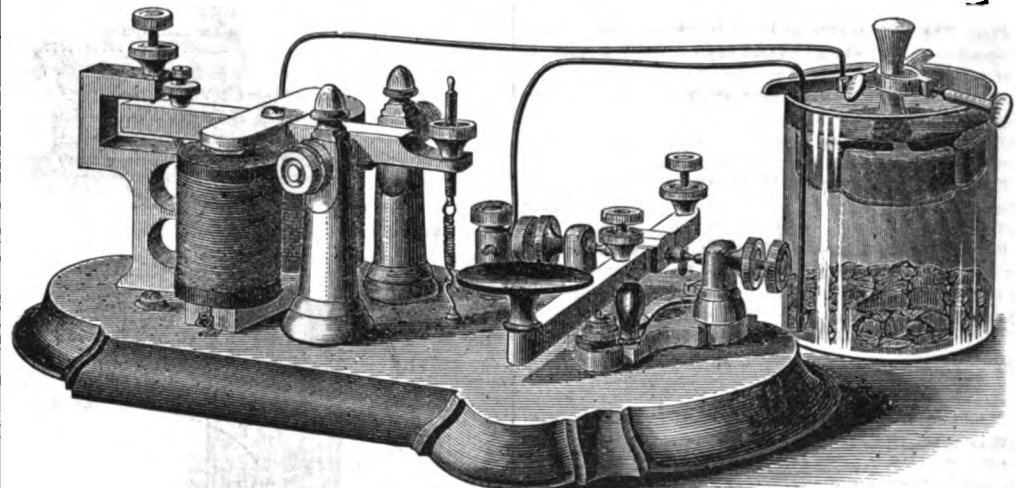
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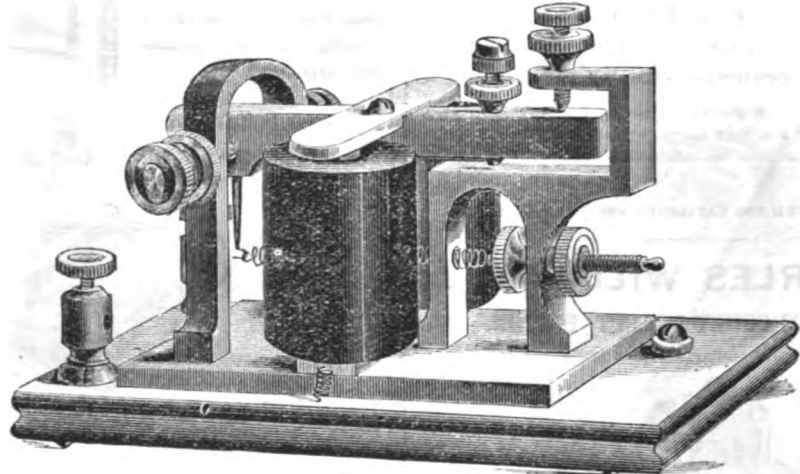
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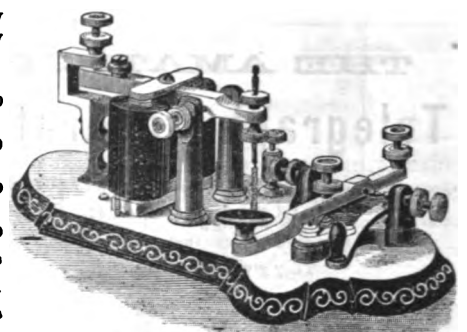
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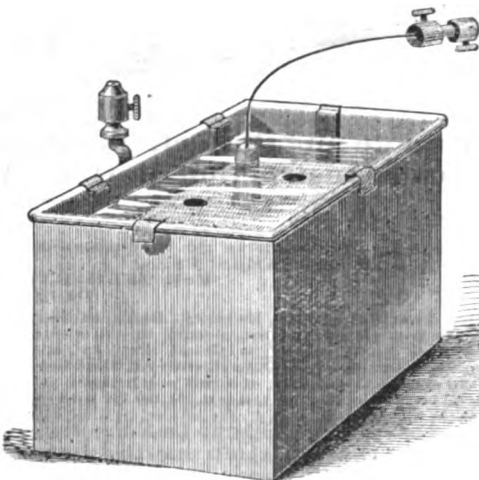
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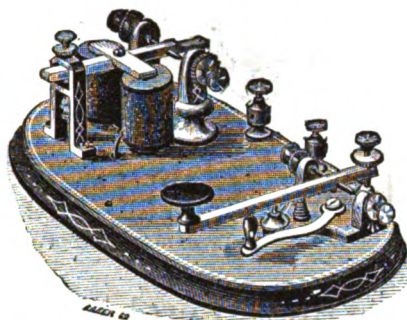
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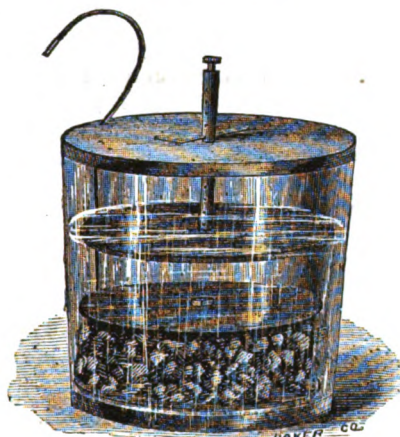
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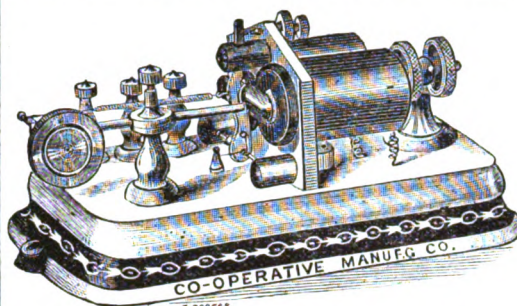
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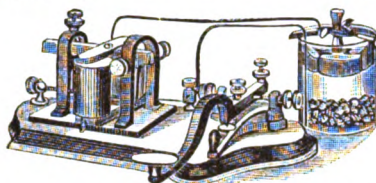
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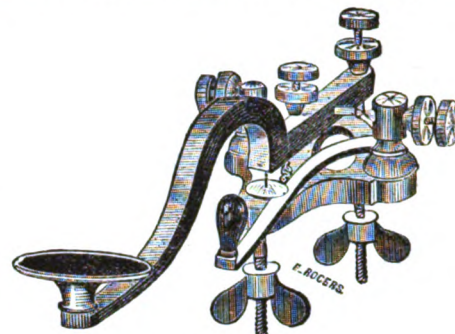
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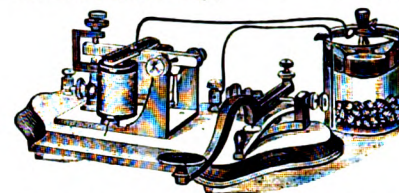
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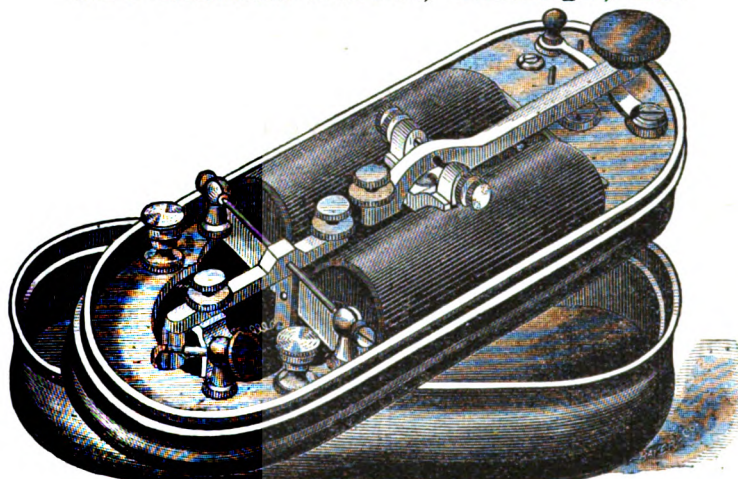
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It is pronounced the best finished and most serviceable Pocket Instrument made.

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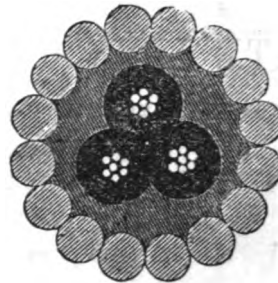
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 19.

NEW YORK, OCTOBER 1, 1875.

WHOLE NO. 190.

## DOES THE EARTH ACT AS A CONDUCTOR OR AS A RESERVOIR OF ELECTRICITY?

When Steinheil made the discovery in 1838, that the earth might be made use of to complete the circuit of a telegraph line, he, in common with other physicists, were at once led to the conclusion that the earth actually conveyed the electric current from one earth-plate to the other, in the same manner as a metallic conductor, and that the resistance of the great mass of the earth was almost infinitely small in comparison to that of a metallic wire of equal length.

The experiments of Matteucci seemed to confirm this theory. He caused four wells to be dug in a straight line, at distances of 80, 30, and 50 yards from each other, and immersed in the two extreme wells, two metallic plates connected with the poles of a battery of ten Bunsen's elements, while the terminals of a galvanometer were connected in the same manner with the two intermediate wells. When the circuit was closed, the needle of the galvanometer was deflected 35 or 40 degrees, from which he concluded that the current actually passed through the earth from one plate to the other. It is, however, quite possible that when the plates are at a distance of only 160 yards from each other that the current really does pass through the earth, for it is usually easy to demonstrate the passage of a tolerably powerful current through a section of earth or of water 20 or 30 feet in length, placed in a wooden trough. But when the earth plates are several miles apart, other conditions affect the result to which these remarks do not apply.

Baumgartner entertains the same opinion as Steinheil and Matteucci, which is based upon his observation that the resistance increases with the section of

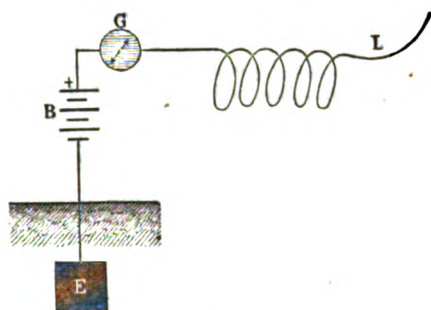


Figure 1.

earth which is interposed between the plates. If these observations applied directly to the matter under consideration, they would settle it at once, but this is not exactly the case. What Baumgartner really did, was to compare the resistances of three lines when the circuit was metallic throughout, and when one part of it was metallic and the rest earth.

Taking the wire as a unit he found the following proportions:

Route.	Distance.	Proportion.
Vienna-Ganserndorf	19.44 miles	3.14.
Vienna-Gloggnitz	52.36 "	6.98.
Vienna-Gratz	134.06 "	4.70.

Comparing these proportions, we at once discover that they do not support the theory that the resistance of the earth increases in proportion to the distance between the plates. Baumgartner, however, concludes that this discrepancy is caused by the varying conductivity of the matter in the earth. In regard to his conclusions, Poggendorff very justly

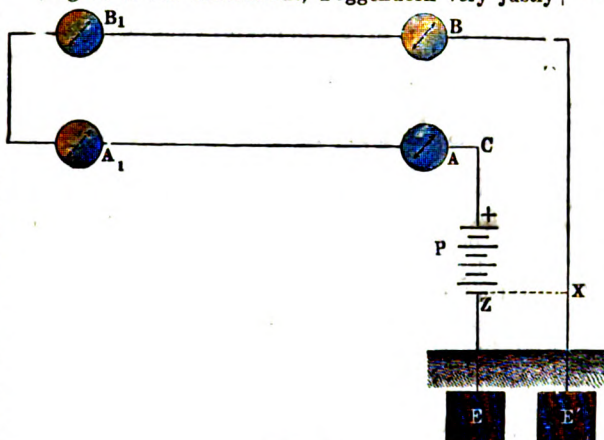


Figure 2.

observes, that the question of polarization has not been taken into account.

If we look upon the earth as a reservoir of the electricity generated by a battery, the first thing is to prove that the battery will produce a current in the metallic part of the line, without it being necessary for the earth to present a conducting medium. This proof may be readily furnished in the following way:

When one pole of a battery B (fig. 1), is in connection with the earth E, the other pole being connected to a long line L, and a galvanometer G is inserted between this pole and the line, the electricity produced in the battery rushes into the line and the galvanometer indicates a current which lasts until the electricity reaches the distant end. The longer the line is, the longer will be the duration of the current, and as Dub justly remarks, assuming that the velocity of electricity is 60,000 miles per second, on a wire four million miles long, we would have a current for more than an hour, after making the connection, without having joined the poles at all. In this case the current flows into the earth in the same way that a constant supply of water would flow into an infinitely large reservoir; without there being a possibility of any accumulation.

We see, therefore, when we employ an infinitely large conductor, that it is not necessary to make connection between the two poles in order to obtain a

current. As it makes no difference which of the two poles of the battery is connected to earth, it is natural to suppose that the current will pass also when both poles are to earth, without admitting the necessity of any connection between the currents through the earth.

The following experiment, the results of which strongly support the opinion that the earth acts as a reservoir instead of a conductor, was made by Wheatstone on a submarine cable of 660 miles in length. The zinc pole of the battery P (fig. 2), was connected at Z and X with the cable, and four galvanometers A, B, and A<sub>1</sub>, B<sub>1</sub>, were included in the circuit in such a way that the two former were in the immediate vicinity of the battery, and the other two were placed almost in the centre of the line so that the distance between A and A<sub>1</sub> as well as from B to B<sub>1</sub> was about 330 English miles; when the circuit was closed at C, the needles of the galvanometers A and B were deflected instantly and simultaneously, while those of A<sub>1</sub> and B<sub>1</sub> followed somewhat later.

When, however, the connection Z X was interrupted (represented by dotted lines in the figure), and the pole Z, as well as the end X of the line, was connected by two metallic plates E and E<sub>1</sub> with the earth, the result was quite different. The galvanometer A was first deflected, then A<sub>1</sub> and B<sub>1</sub>, and last of all B. It follows, therefore, that the earth between E and E<sub>1</sub>, undoubtedly performs a different role from that of the wire Z X between the same parts of the circuit, and consequently, that it does not act merely as a conductor. It may be objected that the resistance of the circuit has been increased so much by including the earth between E and E<sub>1</sub>, that the relative position of the galvanometer B in the circuit has been changed. This theory, however, proves to be untenable from the fact, which is proved by experiment, that the resistance of the earth is infinitely small compared to that of a long telegraph line. Nothing therefore, remains but the conclusion that the earth does not play the part of a conductor in the latter case. On the other hand, the phenomenon is easily explained on the supposition that the earth

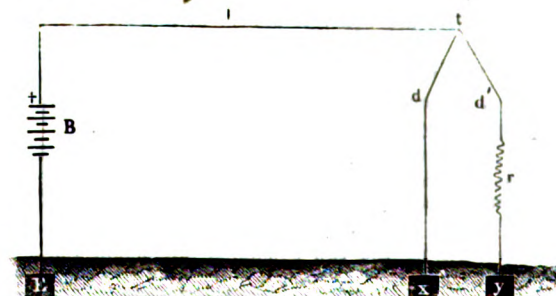


Figure 3.

does act as a reservoir into which the current from the battery flows. We have already seen, when one end of a long line is insulated and the other is con



nected to a battery whose opposite pole is to earth, that the charge proceeds gradually from the battery end toward the end that is insulated, the flow continuing until all parts of the line have received the same potential. From this it is evident that the galvanometer A, which is nearest the battery should be deflected first, and, that the others should follow in the order of their position.

Now, in order that the current may be continuous, it is only necessary for the electricity to be carried off as fast as it is generated in the battery, and this, in fact, is exactly what is done by the earth.

#### ELECTRICAL RESISTANCE OF THE EARTH.

When the electric current flows to earth and disappears, it still meets with more or less resistance in passing from the plates to the earth; but it is obvious that this resistance is quite independent of the distance which separates the earth plates, and, under like circumstances for different distances, it would preserve an unchanged value.

As the resistance of the earth is not very great, while that of a long line is usually very considerable, we may regard the earth's resistance as infinitely small in comparison, and in this case the resistance of the entire circuit is only half what it would be were the circuit metallic throughout. But, if the resistance of the conductor is small, we cannot assume that of the earth to be zero without introducing an error of greater or less magnitude. According to Du Moncel's observations, the resistance of the earth, under very favorable circumstances, is equal to that of an ordinary line wire of about seven miles in length. We see, therefore, that it is not always advantageous to include the earth in circuit, especially when the resistance of the wire does not exceed that of 16,000 feet of line wire. In this case, using earth plates of 15 square inches of surface, the earth's resistance may equal that of 23,000 feet of line wire, which is large in comparison with the metallic part.

The resistance of the earth in any one case depends upon the potential of the battery current, the size of the earth plates, the conducting capacity of the earth in the neighborhood, and, even the direction of the current; for these reasons it is impossible to give a general value that will hold good for all cases; in fact, it is difficult to determine it for any one special case so long as the influence of polarization of the earth plates is unknown. When this has been ascertained, the resistance may be found, according to Nystrom, in the following manner:

Let  $l$  (fig. 3) represent a line in connection with the earth at  $x$ , this latter being the resistance which we wish to determine. Another earth plate,  $y$ , is placed in the neighborhood and connected to the line  $l$  at  $t$  and the two coils of a differential galvanometer are then inserted between  $t$  and the earth plates  $x$  and  $y$ , so that the current passing from  $B$  through  $l$ , branches off at  $t$ , part going to earth by  $tdx$ , the other part by  $tdy$ . Now, as the resistance of the branch wires are equal, it is evident that  $x = y$ , if the needle of the instrument remains at  $0^\circ$ . If it does not we must bring it back by inserting a resistance,  $r$ , in the smaller side, for instance, the one represented by  $tdy$ ; when this is done we have,

$$x = y + r \text{ or } x - y = r.$$

The resistance of the whole circuit  $tdx y dt$  is then measured, which gives us

$$x + y = r_1$$

and combining the two equations we obtain the values

$$x = \frac{r_1 + r}{2} \text{ and } y = \frac{r - r}{2}.$$

It is here assumed that no electro-motive force is active in the circuit except that of the battery used for the test, consequently the plates at  $x$  and  $y$  should be of the same size and the same metal.

## NOTES OF A COURSE OF SEVEN LECTURES ON ELECTRICITY.

BY PROFESSOR TINDALL, LL.D., F.R.S.

(Continued from page 261.)

[From the Telegraphic Journal.]

NOTES OF LECTURE V—March 4, 1875.

1. The Leyden jar is thus charged:—The outer coating being connected with the earth, and the inner coating with the electric machine, the electricity poured into the jar acts inductively across the glass upon the outer coating, attracting the opposite electricity, and repelling that of the same name to the earth. Two oppositely electrified layers are thus in presence of each other, being merely separated by the glass. On bringing the inner and outer coatings, by means of a discharger, near each other, before contact is established, discharge occurs in the form of a spark.

2. The escape of the repelled electricity from the outer coating of the jar may be shown by the gold-leaf electroscope, and by various other means.

3. Instead of allowing the repelled electricity of the outer coating to escape to the earth, it may be employed to charge a second jar, while the repelled electricity of this latter may be employed to charge a third jar, and so on. In fact, by insulating a system of jars, and connecting the outer coating of each with the inner coating of the next, the whole series may be charged by means of the electricity communicated to the first. This is Franklin's "Cascade battery."

4. Instead of glass we may employ any other insulator for the jar. Dry air may be employed. Two plates of brass—the one insulated, the other not, with a layer of air between them—constitute a virtual Leyden jar. The arrangement, however, has a name of its own—the "Condenser."

5. In charging the prime conductor of the electric machine the charge on the conductor continues to augment up to a certain point, after which it is not augmented by the further working of the machine. If the electricity be drawn away from the conductor, and stored up in a Leyden jar, it requires a greater amount of turning to reach the stationary point. This withdrawal, or, as it used to be considered, condensation of the electricity by the attraction of a layer of opposite electricity, is well shown by the condenser.

6. The condenser consists of two metal plates:—the one, called the collecting plate, insulated; the other, called the condensing plate, uninsulated. The nearer the two plates of the condenser are to each other, the more energetic is the "condensation;" and the thinner the glass of the Leyden jar, the more energetic is the condensation. The force of condensation in the Leyden jar was proved by Wilson and Cavendish to be nearly in the inverse ratio of the thickness of the glass.

7. The Leyden jar is sometimes perforated by the discharge of the electricity through the glass. A certain thickness of glass is necessary to prevent this.

8. The influence of the oppositely attractive coating may be well shown by lying a sheet of tinfoil on a table, a plate of glass on the sheet of tinfoil, and a second sheet of tinfoil upon the glass. All being loose, let the upper sheet of foil be connected with a gold-leaf electroscope, and with an electrical machine: turn the machine carefully till the leaves show signs of divergence; then lift the glass and upper coating by means of silk loops. Removed from the condensing action of the lower sheet of foil, the electricity of the upper one diffuses itself so strongly over the electroscope that, if care be not taken, the ruin of the instrument will be the consequence.

9. Sheets of common block-tin, or even sheets of ordinary foolscap paper unwarmed, may be employed in the last experiment, instead of the sheets of tinfoil.

10. With the principle of induction for our guide we can illustrate in various ways the action of the condenser and of the Leyden Jar. Two metal plates, for example, with rounded edges, and with a sheet of vulcanised india-rubber between them, may be made to act as a very powerful Leyden Jar.

11. In the first form of the Leyden Jar the hand of the operator formed the outer coating, and the water the inner coating. But a complete Jar may be formed by two hands, separated by an insulator. Standing, for example, on an insulating stool, with a sheet of vulcanised india-rubber covering my right hand, I clasp with it the left hand of my assistant, who stands on the ground. Laying my left hand upon the conductor of the active electrical machine, my right hand becomes the inner coating, and my assistant's left hand the outer coating, of a Leyden arrangement. On causing the two unclashed hands to touch each other, the "Jar" is discharged, and a strong shock is experienced.

12. A spark may be obtained from the clasped hands sufficient to ignite gas, or to fire powder.

13. The duration of the electric spark is very brief: in a special case Sir Charles Wheatstone found it to be 1-24000th of a second; this, however, was the maximum duration. In other cases it was less than the millionth of a second.

14. When a body is illuminated for an instant the image of the body remains upon the retina of the eye for the fraction of a second. If, then, a body in swift motion be illuminated by an instantaneous flash, it will be seen to stand motionless for the fraction of a second at the point where the flash falls upon it. A rifle bullet passing through the air and illuminated by an electric flash would be seen thus motionless; a circle divided into black and white sectors, and rotating so quickly as to cause the sectors to blend to a uniform grey, appears, when illuminated by the electric spark, perfectly motionless, with all its sectors revealed. A falling jet of water, which appears continuous, is resolved by the electric flash into its constituent drops.

15. Owing to its rapidity, the electric spark, in passing through loose gunpowder, fails to ignite the powder, but scatters it mechanically. By the introduction of an imperfect conductor—a wet string, for example—the discharge is retarded, and the powder fired. (The combustion of gun-cotton when detonated is, I am informed, so rapid that magnesium powder mixed with the cotton is unconsumed).

16. Dry air is an insulator, which must be broken through to produce the electric spark. The comparative ease with which the discharge passes through a partial vacuum has been already, to some extent, illustrated. Through an exhausted glass tube, six feet long, a discharge freely passes which would be incompetent to leap over a minute fraction of this interval in air. But whereas the spark in air is dense and brilliant, the discharge in *vacuo* fills the exhausted tube with a diffused light.

17. Priestly thus describes the light in *vacuo*:—"Take a tall receiver, very dry, and in the top of it insert with cement a wire not very acutely pointed; then exhaust the receiver, and present the knob of the wire to the conductor, and every spark will pass through the vacuum in a broad stream of light, visible through the whole length of the receiver, be it ever so tall. This stream often divides itself into a variety of beautiful rivulets, which are continually changing their course, uniting and dividing again in the most pleasing manner. If a jar be discharged through this vacuum it gives the appearance of a very dense body of fire, darting directly through the

centre of the vacuum without ever touching the sides."

18. Cavendish employed a double barometer-tube, bent into the form of a horse-shoe, with its curved portion empty, to show the passage of electricity through a vacuum. But it is really not the vacuum which conducts the electricity, but the attenuated air and vapor which fills the space above the barometric columns. When the mercury employed is carefully purged of air and moisture by previous boiling, the space above the mercury—as proved by Walsh, De Luc, Morgan, and Davy—is wholly incapable of conducting electricity. I have seen a similar experiment in the laboratory of Mr. Gassiot, to whom we are indebted for so many beautiful electrical experiments.

19. Electricity therefore does not pass through a true vacuum; it requires ponderable matter to carry it. If, moreover, a gold-leaf electroscope be kept at a distance from all conductors, it may be kept charged for an almost indefinite period in a good air-pump vacuum.

20. The matter rendered thus luminous by the electrical discharge is attracted and repelled like other electrified matter. "A finger," says Priestley, "put on the outside of the glass will draw it [the luminous stream] wherever a person pleases. If the vessel be grasped with both hands, every spark is felt like the pulsation of a great artery, and all the fire makes toward the hands. This pulsation is felt at some distance from the receiver; and in the dark a light is seen betwixt the hands and glass."

21. "All this," continues the historian of Electricity, "while the pointed wire is supposed to be electrified positively; if it be electrified negatively the appearance is remarkably different. Instead of streams of fire nothing is seen but one uniform luminous appearance, like a white cloud, or the milky-way on a clear starlight night. It seldom reaches the whole length of the vessel, but is generally only like a lucid ball at the end of the wire."

22. Of the two appearances here described, the former is now known as the *electric brush*, and the latter as the *electric glow*. Both can be produced in air. The glow is sometimes seen on the masts of ships, and it is mentioned by the ancients as appearing on the points of lances. It is called St. Ermo's or St. Elmo's fire, after the sailor's saint, Erasmus, who suffered martyrdom at Gaeta at the beginning of the fourth century.

23. The color of the diffused light referred to in Note 16 depends upon the residue of attenuated gas, or vapor, through which the discharge passes. If it be an oxygen residue the light is whitish; if it be a hydrogen residue the light is red; if a nitrogen residue the light is purple, exactly resembling the color displayed at times by the aurora borealis—a color doubtless due to the discharge of electricity through the attenuated nitrogen of the air.

24. When this electric light is subjected to prismatic analysis it is found to produce, not a continuous spectrum, with the seven colors gradually passing into each other, but a series of separate and distinct bands. At an early period such bands were noticed in the spectrum of the electric spark. They are, for the most part, due to the vapor of the metals between which the spark passes. The spectrum of the electric discharge is often of a very complex character, being in part due to the gas through which the discharge passes, and in part to the incandescent vapor of the electrodes.

25. This vapor and the particles of the electrodes enables an ordinary voltaic current to cross a space which it is quite incompetent to cross when occupied by air.

26. The spectrum bands of incandescent vapors, which are perfectly constant, furnish by their con-

stancy a means of analysis by the prism. Hence has resulted that powerful and far-reaching mode of inquiry called spectrum analysis, which has led to the discovery of new metals, to a secure knowledge of the constitution of the sun and his appendages, and of the nebulae, comets, and fixed stars.

27. The electric spark produced within a ball of ivory, an orange, or an apple, illuminates the body throughout. Eggs through which the discharge of the Leyden Jar is passed are similarly illuminated.

#### EXPERIMENTS IN LECTURE V.

(1.) Leyden Jar placed on table; outer coating connected with electroscope: no divergence of leaves when electricity is communicated to the knob.

(2.) Jar placed on india-rubber cloth, with outer coating connected with electroscope: leaves diverge when electricity is communicated to knob. The electricity of the outer coating was here prevented from flowing to the earth, and flowed over the gold leaves. Detach wire, and prove electricity positive.

(3.) Taking oldest form of Leyden jar, with its nail and water, in the left hand: standing on insulating steel, and stretching a lath from the right hand to the electroscope: on electrifying the nail, the gold leaves diverge. As before, the electricity proves positive.

REMARK:—A rubbed glass tube amply suffices to communicate to the jar the small charge needed for these experiments.

(4.) The action of Franklin's "cascade battery" referred to in Note 3 was illustrated.

(5.) Bringing the two plates of a condenser close together, but not in contact, and charging gently the insulated plate, which is connected with the electroscope, the leaves diverge slightly. On withdrawing the condensing plate they fly asunder: they fall again when condensing plate is brought near. Divergence and collapse always follow withdrawal and approach of condensing plates.

(6.) Notes 8 and 9 were illustrated. Block tin is very convenient. A plate of glass or a piece of india-rubber cloth may be used as the insulator. For the block tin, moreover, sheets of common foolscap may be employed. In the actual experiment, the table was covered with paper; a piece of vulcanised rubber, or of glass, was laid on the table, and on it a leaf of foolscap, which was connected by a wire with the electroscope. On electrifying the foolscap, and alternately lifting it and lowering the glass or india-rubber, effects quite as instructive as those produced by the condenser were obtained.

(7.) Charged with the electrical machine instead of the glass tube powerful sparks passed from plate to plate in the experiment referred to in Note 10.

(8.) The action of the Leyden jar formed of the clasped hands referred to in Note 11 was illustrated. A brass rod with a small ball at the end was used to ignite the gas from an Argand burner. The shock at the same time was very smart.

(9.) A circuit was formed between the prime conductor of the machine and the earth, a Leyden jar being included in the circuit. At one place (the focus of a small reflector) the circuit was interrupted, and immediately in front of this focus was the rotating disc referred to in Note 14. On working the machine the jar was periodically discharged; and at every spark the rotating disc appeared for a moment motionless, with all its sectors visible.

(10.) Note 15 was illustrated.

(11.) Note 17 was illustrated.

(12.) The double barometer-tube being connected on the one side with the conductor and on the other with the earth, a feeble gleam of light appeared in the bent portion of the tube when the machine was worked. On introducing a space in the circuit, over which the electricity leaped into a spark, a vivid bow of light, which increased in brilliancy as the spark was lengthened, filled the tube.

#### THE EARTH AS A MAGNET.

The address of Professor Balfour Stewart, the President of the Mathematical and Physical Section of the British Association for the Advancement of Science, read at their recent meeting at Bristol, England, contains the following remarks, which will be read with interest:—

"We are aware that the earth is a magnet. Let us not now concern ourselves about the origin of its magnetism, but rather let us take it as it is. We must next bear in mind that rarefied air is a good conductor of electricity; indeed, according to recent experiments, an extremely good conductor. The return trades that pass above from the hotter equatorial regions to the poles of cold, consisting of moist rarefied air, are therefore to be regarded in the light of good conductors crossing lines of magnetic force; we may therefore expect them to be the vehicles of electric currents. Such electric currents will of course react on the magnetism of the earth. Now, since the velocity of these upper currents has a daily variation, their influence as exhibited at any place upon the magnetism of the earth may be expected to have a daily variation also. The question thus arises. Have we possibly here a cause which may account for the well-known daily magnetic variation? Are the peculiarities of this variation such as to correspond to those which might be expected to belong to such electric currents? I think it may be said that as far as we can judge there is a likeness of this kind between the peculiarities of these two things, but a more prolonged scrutiny will of course be essential before we can be absolutely certain that such currents are fitted to produce the daily variations of the earth's magnetism. Besides the daily and yearly periodic changes in these upper convection currents, we should also expect occasional and abrupt changes forming the counterparts of those disturbances in the lower strata with which we are familiar. And these may be expected in like manner to produce non-periodic occasional disturbances of the magnetism of the earth. Now it is well known that such disturbances do occur, and further, that they are most frequent in those years when cyclones are most frequent, that is to say, in years of maximum sunspots. In one word, it appears to be a tenable hypothesis to attribute at least the most prominent magnetic changes to atmospheric motions taking place in the upper regions of the atmosphere where each moving stratum of air becomes a conductor moving across lines of magnetic force; and it was Sir William Thomson, I believe, who first suggested that the motion of conductors across the lines of the earth's magnetic force must be taken into account in any attempted explanation of terrestrial magnetism. It thus seems possible that the excessive magnetic disturbances which take place in years of maximum sunspots may not be directly caused by any solar action, but may rather be due to the excessive meteorological disturbances which are likewise characteristic of such years. On the other hand, that magnetic and meteorological influence which Mr. Broun has found to be connected with the sun's rotation points to some unknown direct effect produced by our luminary, even if we imagine that the magnetic part of it is caused by the meteorological."

A magnificent display of vacuum tubes was exhibited by Mr. F. J. Fry, of Bristol, a gentleman who has, perhaps, the largest display of these splendid philosophical toys in the kingdom. Clamond's new thermopile was likewise exhibited in full action, working a small induction coil. This instrument is the most satisfactory solution that has yet been offered of the problem of converting heat directly into electricity in a practical form.

## THE TORPEDO SYSTEM.

At the naval station at Newport, R. I., recently, in the presence of the Secretary of the Navy and other high officials, experiments on a grand scale were conducted to illustrate the efficiency of the Torpedo service, which is undoubtedly destined to play a very important part in future warfare.

We condense the following interesting account of the experiments from the correspondence of the *New York Herald*:

The gradual introduction of torpedo vessels into fleets, the general emotion which the appearance of these terrible engines has created, the attention with which naval officers of all countries watch the progress of this new arm, now an offensive power, and the complete revolution which they will probably produce in naval tactics, are sufficient reasons for rendering the study of torpedoes not only necessary but attractive to officers of all navies.

A practical knowledge of electricity and of the chemistry of explosives is absolutely necessary to enable one to prepare and manipulate torpedoes intelligently.

Torpedoes are divided into two great classes—offensive and defensive. The first includes every class of device designed for the active attack of vessels, whether arranged at the end of a spar or boom attached to a suitable vessel or to be carried on board ship and thrown out or launched with a view of acting against a vessel in chase and exploded by electricity or mechanically, when in actual contact with her, or to be used for the attack of a vessel at anchor. Instructions in all such appliances worthy of use is a part of the regular course at the Torpedo Station, also practice in the demolition of torpedoes and the practical use of apparatus adapted for searching for and carrying off an enemy's mine and the defence of vessels against mines of every class, whether stationary or drifting.

The Secretary of the Navy had never visited the station before and must have felt highly gratified at the completeness of the discipline and the warmth of his reception. The electrical instruments by which most of the torpedoes were to be fired were placed on the croquet lawn on an elevated plateau adjoining the southeast corner of the Commandant's house and overlooking the harbor. These were connected with the batteries of the electrical building. Professor Farmer was in charge aided by Lieutenant Merrill, Converse Cowden and by Commander Manley. Among these instruments was an electric chronograph, invented and perfected by Farmer, worked by a pendulum driven by electricity, and designed so that it will fire from one to 120 torpedoes in a few seconds. By the side of this was an electric engine invented by Lieutenant Moore, which equals at best about two-horse power. The first item on the programme was a novel subaqueous salute to Secretary Robeson of nineteen torpedoes, each charged with ten pounds of powder, arranged in line south of the ferry landing. These were fired in the presence of the whole company by Lieutenant Manley, by the action of the pendulum of the chronograph above named, at intervals of six seconds, commencing southward. This was certainly one of the most exciting experiments ever undertaken. At the first explosion a huge column of spray was thrown up to the height of 100 feet; the second threw up a large volume, some of which sprinkled the persons nearest the shore; the third was like the discharge of a tremendous fountain, whose spray reached at least an altitude of 250 feet and subsequently settled down on to the slopes; and so it was to the end. No better description can be given than to imagine a row of nineteen giant fountains whose streams of water rise

up in massive column to the average height of 180 feet, each opening with a loud report and concussion.

The experiments were chiefly intended to show the utility of applying electricity under various conditions to the torpedo service, and thus, as a further illustration, Mr. Merrill next employed a twenty-five pounder north of the ferry, in deep water, to show the usefulness of Farmer's D. E. machine for boats. The harbor was full of boats and yachts, which the government steam launch had been unable to keep off up to this time; but the tremendous shock of this explosion and the probability of a drenching by the falling of water soon sent some of the foolhardy sight-seers to the "right about."

Torpedo No. 3 consisted of 100 pounds of powder, placed east of the landing, and was fired by Farmer's machine for ships. This was in deep water. At the instant of the discharge, it seemed as though 1,000 cannon had been fired under water. The spray flew up nearly 300 feet, deluging the persons in the nearest craft, and causing the water to seeth like a vast whirlpool.

Torpedo No. 4 was fired by the Lay torpedo boat against a raft at about 1,000 feet distance. The boat having a five pound torpedo fastened on the stern, was handled from the croquet lawn by Lieutenant Bradford. The boat is made almost in the shape of a cigar, with two pointed ends, and is almost totally submerged, the green outline appearing above the water being almost like a huge green fish. The boat is fitted up inside with a small oscillating engine, driven and steered by carbonic acid gas, the steering being regulated through the electric machine, and by means of which it can be made to perform the most difficult evolutions so long as there is any gas left in the receiver. The object of the invention is to attack an enemy's vessel at a distance of two or two and a half miles and by means of immense torpedoes or charges of gunpowder or nitro-glycerine destroy the enemy and boat also. After a few fancy manoeuvres the deadly looking craft made right for the target, and in a few seconds the edge posts were shivered into atoms and thrown into the air a distance of twenty feet. Then the boat was sent on a cruise among the sailing boats and turned round and round with a rapidity that was astonishing considering the distance. The movements of the screw caused considerable splashing of the water, and it seems doubtful if the boat would not receive a very wide berth and a hot reception if an attempt should ever be made to use it against an enemy by daylight. Still the boat was not submerged to her usual depth, in order that the visitors might be enabled to see her better.

Experiments were next made with the Ericsson torpedo boat. This boat is of a peculiar structure; about twenty-five feet long, an average of eighteen inches wide, having side rudders made of iron beneath the surface, which work in a vertical instead of in a horizontal plane. The engine was worked by compressed air, which was forced through an inch india rubber tube from the air box of a twenty-five horse power engine. The hose supplying the air is 800 feet long. The length used is also used to draw back the boat. The engine was started and the two propellers, which work in opposite directions, were set in motion. The air pressure was from seventy-five to a hundred pounds, and soon the tube, like an immense tail, began to run out after the boat.

In a few seconds the boat began to sink, and as the speed of the stationary engine on the Nina was increased she sunk deeper and deeper, until the disk on the ten-foot iron shaft on the upper portion of the boat was only three feet above the surface. Unlike the Lay boat she made no ripple, and all that could be seen above the water at 600 feet distant was

the disk. The air is made to steer her through the tube that supplies her cylinder as effectually as the carbonic acid gas is made to govern the movements of the other boat. Great interest was manifested on this invention. As soon as the pressure is taken off the boat rises to the surface; when speed is gained she sinks completely.

Next a group of torpedoes, six in number, were exploded north of the landing. They were in about six feet of water and charged with powder, from ten to forty pounds. These were fired by several ladies present. There was another row of startling water jets which would have sent a small fleet to "Davy Jones locker" in a few seconds.

A steam launch next appeared, with two seventy-five pounders rigged on spars at the bow. These were rapidly fired by Lieutenant Commander Wildes and several assistants. When the splash and splinters had cleared away the Nina came past the stand with a 100 pound service torpedo rigged to a spar, which was exploded as she passed the stand. The torpedo used in this way is intended as a substitute for the ram which is attracting so much attention in modern naval warfare. In a few seconds, however, she returned to the charge towing in her wake a "Harvey," which she quickly dragged against a floating raft and sent everything literally sky high, creating another panic for the small boats, that had gradually drawn closer to the scene of terror. Now followed in rapid succession three fifteen pounders, which were fired by the contact of a small steam launch with buoys containing circuit closers of peculiar construction.

In connection with these experiments the circuit indicator designed by Lieutenant Converse was used, which gives to the officer in charge absolute information as to the condition of his cables and torpedoes at all times. If a wire becomes defective or broken, it is signaled instantly by the ringing of a bell, which sound is kept up until the defect is repaired. It also enables him to fire torpedo at will when the enemy's vessel does not come in contact with the circuit closer, and yet is near enough, in his judgement, to send her to the bottom. At the same time the torpedoes can be rendered safe to a friendly vessel, their approach being merely signaled by the ringing of a bell, this being, in fact, the most complete apparatus yet designed. When one torpedo is fired, however, all others are thereby disconnected from the battery for half a minute, thus rendering it impossible for one torpedo to be fired by the action of another.

The next experiment was the simultaneous firing of seventy-nine dozen igniters. These were followed again by two extemporized torpedoes, the one in an old tin oil can, the other in a molasses jug, which rattled and thundered so that the whole of Newport must have been affected. These were constructed, at the request of the Secretary, by Messrs. Higginson and Davenport from the materials at hand. After the experiments on the east side of the island, Professor Hill created a commotion by exploding a hundred pounds of nitro-glycerine, placed to the west of the island, five feet from the surface of the water. The shock was quick and severe, and thousands of fish came instantly to the surface, apparently stunned, while many others were treated to a brief aerial voyage.

At the spot called Junction No. 12 by the experimenters, was effected the explosion of twenty-five pounds of dynamite under a raft which was floating on the surface of the water. This was the most splendid piece of work yet accomplished. The water was agitated a quarter of a mile distant from the raft, and the volume of water thrown in the air was laden with the splinters, which fell again into the water like match-wood. The grandest spectacle



of all was the last. The old coast survey schooner Bowditch lay quietly at anchor, 1,300 feet distant, under bare poles. Near her were a hundred little sail boats, which the steam launch was endeavoring to drive off; beneath her, however, was a terrific mine, consisting of three 100-pound gunpowder torpedoes and 250 pounds of dynamite in two others.

Mrs. Field, wife of Judge Field, of the Supreme Court, closed the circuit, and in an instant a vast column of water ascended about 300 feet, followed by a roar and a concussion, and the timbers of the stately looking old craft were flying through the air. In the place where she had rested so placidly but a few seconds before a whirlpool was now seen spreading out its waves and receiving the falling debris as it descended, splash, splash, into the harbor; it was a complete annihilation. Not enough to make a doorpost, scarcely, was left whole. The hulk disappeared like a dream, for the instant the explosion took place she was crushed and carried up in the form of chips in the vast volume of water thrown by the force of the mine beneath.

#### ON PHENOMENA PRODUCED BY HIGH POTENTIAL ELECTRIC CURRENTS, AND THEIR ANALOGIES WITH NATURAL PHENOMENA.

By GASTON PLANTE.

This question was a short time ago ventilated in a paper I had the honor to lay before the Academy of Sciences. Since then the following facts have been brought to notice, which I deem of interest as bearing upon the same subject.

By using a U-shaped voltmeter full of salt-water, and submitting it to the action of an electric source such as was used before, it was observed that—If, when the negative wire is plunged into one of the tube-voltmeter's branches, the extremity of the positive wire—slightly bent back—be brought into contact with the glass of the other branch, a little above the liquid, a sparkling crown, or wreath, produced by the saline particles which cover the tube, will be at first perceived. On causing the wire to approach the liquid a depression is produced; a luminous arc, bounded by radiating striae, appears along the glass, and becomes transformed into a demi-wreath of sinuous outline, animated by a rapid undulatory movement. A peculiar, incessantly increasing, rustling noise is heard, and some steam escapes in rapid jets, as if it came from a boiler under pressure. In a short time, the liquid which moistened the glass around the electrode having evaporated, these effects cease; only, however, to recommence immediately afterwards. If the wire be immersed yet deeper, a closed luminous ring is formed; to this ring another succeeds, and we have thus a generation of brilliant waves, in the middle of which the liquid is agitated by a rapid whirling movement. Sometimes around the eddying liquids small luminous irregular rings are seen detached from the glass and the electrode; then all these waves terminate by mutually mingling together, the liquid becomes completely luminous, and partakes of a violent ebullition. During this time the deflection of a magnetized needle placed near the circuit betokens continual variations.

The following experiment illustrates a curious effect arising from the vaporization of water by electricity:—If the positive platinum wire be introduced into an open capillary tube, so that the wire reaches the level of the lower orifice of the tube, a rustling noise is produced on plunging it in; and if it be lifted up again a sudden slight detonation is heard, similar to that from a percussion-cap. The tube is not, for all that, either broken or split; but the lower capillary orifice, where the end of the platinum wire is, is rendered conical in form, and the glass is hollowed

into a funnel shape. Nevertheless there has not been a discharge (properly so called), for the electrode produces no noisy spark, either on entering or leaving the liquid; the phenomenon is purely mechanical, due to the sudden entry of the air into the tube. The intensity of the noise is remarkable when we consider the scantiness of the annular space between the wire and the tube, and that the tube is open at both ends. We have, however, common examples—such as a thunder-clap, noises caused by the energetic displacement of free air; and it may be conjectured that wherever an empty space is made by so rapid a motion as that of electricity, this sort of *electric clap* will be produced. If the capillary tube be closed at top, the phenomenon is reproduced with great facility.

When the platinum wire is restored to the open tube the vapor bubbles formed at its extremity break the current; as they condense the liquid is drawn up into the tube to re-fill the empty space thus formed, and rises to the upper portion, whence it falls back again in sparkling filets. Fresh balls of vapor re-form and condense, the liquid remounts, and the phenomenon reproduces itself in an intermittent manner.

In the previous experiments the positive wire was in contact with the U tube; if this wire be plunged into the liquid without touching the glass, luminous globules (already described) animated by a gyratory movement will be produced. The length of the liquid column is not an obstacle to their production; it appears to behave as the insulating plate of a condenser. When the negative wire is deeply immersed, and the liquid around it thus kept strongly negative, the luminous globules formed at the positive pole disappear without sparks at the negative pole, and allow the electricity they enclose to flow into the air or to the surface of the liquid. But, when the negative wire is only slightly immersed, if the positive wire be also immersed its immersed surface is soon found to be greater than that of the negative wire, by the spherical agglomeration of the liquid in its neighborhood. The current then traverses the voltmeter, instead of remaining accumulated at the surface, and the properly called discharge is then produced with a noisy spark, fusion, or volatilization, of the electrode at the negative pole.

Several conclusions may be drawn from these phenomena, in explanation of the effects of atmospheric electricity.

First of all we meet with representation of various kinds of lightning flashes. The electrified globules formed by the aqueous vesicles of the clouds may be produced or dissipated without explosion, and so give rise to electric glimmerings (or flashes without thunder, as are sometimes seen in the middle of storm-clouds). We can also understand how electrified globes, observed near the ground, may be harmless under certain circumstances, may pass near observers without striking them, may locate themselves on telegraph wires without melting or volatilizing them. The phenomenon just described under the name of electric thunder-clap may illustrate the noise of thunder,—not that there is in this case a discharge as at the time of the thunder-stroke; but this experiment offers an analysis of the noise which is produced at the time of the cessation of all electrical effect powerful enough to have previously vaporized or volatilized the material opposed to its passage.

The same series of experiments explains the crackling noise of waterspouts; the mist which is formed around them, likened to that which leaves a steam-boiler; the silent flashes which rend them; the fire-balls at their extremity; and the bubbling agitation of the waters when they touch the surface of the sea. These meteors may be compared to positive liquid or vapor electrodes from which the powerful electric cur-

rents of storm-clouds escape towards the land or sea; and, if they are not accompanied with fulminating effects, it is because the conducting cloud accompanies them to the earth, and because there is not in that case a properly called electric discharge, any more than in our experiments. The conical form of water-spouts may be explained by the tendency of positive electricity to fashion itself to a point under certain conditions. As to their gyratory motion, though the electric flow seems to produce by itself whirling effects, mechanical actions may also account for them, and we can only affirm that electricity is the cause or effect of it. Electricity plays a most important part in these meteors, and if the descending movement appears to be the natural motion of waterspouts, the suction effects repeatedly observed when the cloud-cone reaches the surface of the ground or sea may be explained by the vaporization which the escaping electric torrent produces, by the empty space resulting from it, and the tendency of all matter to be precipitated there.

We also recognize in these experiments the principal phenomena of *polar auroras*—such as luminous arcs; the crowns and demi-crowns of brilliant rays, or of sinuous outlines animated by an undulatory movement; the crackling noise attending them; that luminous effervescence which has been compared to a sea of flames; the condensation of vapors; and the magnetic storms accompanying these grand natural phenomena. The concaveness of the luminous arc in the voltmeter, turned towards the point whence the positive electricity flows when compared with aurora arcs turned towards the earth, shows that the flow of electric currents brought from the Equator by the upper winds takes place from the regions of high atmospheres to those still more elevated. These currents, by flashing against the polar frozen clouds, which correspond to the saline particles and the damp glass of the voltmeter—become transformed into heat and light, and vaporize the polar clouds, which fall down condensed as abundant snows or rains.\* Thus the polar auroras are not due to discharges between the electricity of the air and of the ground, but rather to dissemination into the high air—under a caloric and luminous form—of large masses of electricity proceeding from the surface of the terrestrial globe.

Lastly, if we may still further extend these analogies, we meet in the foregoing phenomena (such as electrical globules endowed with a gyratory motion, or whirlwinds detached from electrified matter, luminous at their periphery) with an infinitely small reproduction of the possible manner of formation of celestial bodies,—spherical or annular,—and a rapid representation of their development until their extinction or transformation into space. One is thus led to believe that, in the consideration of the first impulse given to the work of creation, or the number of different movements impressed upon ethereal matter in this work—we ought to take into account this particular mode of movement which constitutes electricity, although it be masked under the more striking appearance of heat and light.

During the meeting of the British Association for the Advancement of Science, at Bristol, there were two soirées in the Colston Hall. At the second several electrical inventions were exhibited. The display of telegraphic apparatus, which to a certain extent was a historical one, contained the original instrument of Cooke and Wheatstone, which was used on the first telegraphic circuit, viz., that between Paddington and Slough.

\* The appearance of aurora borealis is almost always accompanied by great downfalls of rains or snow.

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

## EXECUTIVE OFFICE,

WESTERN UNION TELEGRAPH COMPANY,

Broadway, cor. Dey street, New York, October 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Divide, Col., changed to Weissport.

Messages taken for Forestville, Conn., will be delivered either by special messenger or train from Bristol, Conn. Charges for delivery one dollar and 25 cents respectively.

Tybee, given in last JOURNAL as in S. C., is in Ga. Bensenville, Ill., in Tariff Book as Benseyville, should read Bensenville.

The P. O. Address of Specht's Ferry, Iowa, is "W. U. Tel. Office, Specht's Ferry, Iowa, via Potosi, Wis. P. O."

Rocky Hill, Ky., closed.

Hereafter the "tariff for other lines" from New Orleans to Pass-a-L'Ouvre and South West Pass, La., will be 150 and 10 to each.

Half rate messages may be taken for, and received from the following other line offices in La:

Campit,	Coushatta,
Natchitoches,	Ringgold.

New Windsor, Md., closed.

Messages taken for the following places in Maine will be delivered from Portland. Charges for delivery as given herewith:

East Deering,	\$0.50.
Libby's Corner,	.25.
Ligonia Village,	.50.
Woodford's Corner,	.35.
Ferry Village, (Cape Elizabeth),	.35.
Fort Preble, "	.50.
Knightville, "	.25.

Bar Mills, Cumberland Mills, Gorham and Saccarappa, Me., are now W. U. Offices, all in square 14. Check direct.

Alfred, Centre Waterboro, East Lebanon, South Waterboro and Springvale, Maine, are now W. U. Offices. Square 17. Check direct.

Grout's Corners, Mass., changed to Millers Falls.

Mason Village, N. H., changed to Greenville.

East Rochester and Rochester, N. H., are now W. U. Offices in Square 17. Check direct.

Sea Grove Hotel, Sea Grove Village, N. J., closed. Messages will be delivered from Cape May City. Charges for delivery, 75 cents.

Messages for East Orange, N. J., may be accepted at the rate to Orange Junction, to which office they should be checked.

Pine Valley, Chemung Co., and Starkey, N. Y., are now W. U. Offices, both in square 83. Check direct.

Stanley, N. Y., is now a W. U. Office, square 92. Check direct.

Chicago Junction, O., is now a W. U. Office, square 201. Check direct.

Pikeville, O., closed.

Centennial Grounds, West Philadelphia, Pa., is now a W. U. Office, square 59, tariff same as Philadelphia. Check Philadelphia.

Carpenters, Gillette and Roaring Branch, Pa. are now W. U. Offices, all in square 93. Check direct.

Dalton, Luzerne Co., Pa., is now a W. U. Office, square 58. Check direct.

Managers accepting messages for Brady's Bend, Pa., should collect 25 cents for delivery of the same from East Brady's Bend and 50 cents for delivery of messages for Queenstown, Armstrong Co., Pa.

Penningtonville, Pa., closed.

Kazabazua, Que., closed.

Gallatin, Tenn., closed (second notice). Messages for Gallatin, will be mailed from Nashville.

Henrietta, Texas, changed to Cambridge. Messages for Henrietta, will be mailed or delivered by messenger from Cambridge. Charges for special delivery, 25 cents.

## SUMMER OFFICES CLOSED.

Pequot House, New London, Conn.

Fort Point, Me.

Bethlehem, N. H.

Crawford House, N. H.

Fabyan House, N. Y.

Glen House, N. Y.

Mt. Washington, N. H.

Mt. Washington Depot, N. H.

Profile House, N. H.

Twin Mountain House, N. H.

Waumbeck House, N. H.

Catskill Mountain House, N. Y.

Cozzens Hotel, West Point, N. Y.

Highland House, (Garrison), N. Y.

Lebanon Springs, N. Y.

Shelter Islands Camp Grounds, L. I., N. Y.

Trenton Falls, N. Y.

Little Mountain, O.

Cresson Springs, Pa.

Highgate Springs, Vt.

Lake Dunmore House, Vt.

Yellow Sulphur Springs, Va.

## NEW OFFICES.

275 Brownsboro', Ala.

553 Weissport, Col. (formerly Divide.)

262 Burlington, Ind.

299 Dana, Ind.

261 Larwell, Ind.

377 Perlee, Iowa.

507 Detroit, Ka.

595 Lakin, Ka.

\* Balize, La., 100 and 5 from New Orleans.

\* Port Eads, La., 150 and 10 " "

\* Poverty Point, La., 100 and 5 " "

\* Quarantine, La., 100 and 5 " "

14 Morrills Corner, Me.

\* Gardners Elevator (Canton, Balto.), Md., 15 and 1 from Baltimore.

28 Millers Falls, Mass. (formerly Grout's Corner.)

28 Greenville, N. H. (formerly Mason Village.)

\* Flax Mill, N. J., 25 and 2 from Easton, Pa.

\* Lansdown, N. J., 25 and 2 " "

\* Musconetcong, N. J., 25 and 2 " "

\* Pattenburg, N. J., 25 and 2 " "

\* West End, Hunterdon Co., N. J., 25 and 2 from Easton, Pa.

33 Great Neck, L. I., N. Y.

211 Air Line Junction, O. Check Toledo.

212 Robinson, O., P. O. Address, North Robinson.

242 Somerville, O.

233 Spring Grove, O.

\* Mattawa, Ont.

\* Deux River, Ont.

\* St. Maurice, Que.

321 Chewalla, Tenn.

\* Brackettville (Fort Clark), Texas, 25 and 1 from San Antonio.

\* Castroville, Texas, 25 and 1 from San Antonio.

\* Camp Colorado, Texas, 50 and 2 from Denison.

\* Cambridge, Texas, (formerly Henrietta), 25 and 1 from Denison.

\* Edinburg, Texas, 25 and 1 from Brownsville.

\* Uvalde, Texas, 25 and 1 from San Antonio.

35 Barre, Vt.

\* Vienna, Va., 25 and 2 from Alexandria.

171 Cairo, W. Va.

All business of the War Department and of its officers and authorized agents, will be transmitted free over "other lines" to all offices in Arizona and the following in California, Ind. Terr. and Texas:

Campo, Cal.

Fort Sill, Ind. Terr.

Brackettville (Fort Clark), Tex.

Cambridge, Texas.

Castroville, Texas.

Edinburg, Texas.

Graham City, Texas.

Griffin, Texas.

Jacksboro, Texas.

Pilot Point, Texas.

Camp Colorado, Texas.

Over the lines of this Company the War Department business will be charged for at the usual rate for Government business.

## ATLANTIC CABLE.

## CHANGE IN RATES.]

On and after October 4, 1875, the tariff for Atlantic Cable messages to Great Britain, Ireland, and France, will be as follows:

From New York City, and all points in Nova Scotia, New Brunswick, and New England States.....	\$1.00
From all points in New York (except New York City), New Jersey, Pennsylvania, Delaware, Maryland, and District of Columbia.....	\$1.03

For each word,  
IN GOLD.

From all points in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan, and Wisconsin, from St. Louis, Mo., and from Western Union Company's offices in Florida.....

\$1.15

From all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dacotah, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada, California, Arizona, Oregon, and Washington Territory.....

\$1.20

British Columbia.....

\$1.35

Hereafter the continental rate for 20 words or less from London will be as follows:

To Belgium, \$0.62.	Denmark, 1.25.
Holland, .94.	Norway, 1.25.

## CUBA CABLE.

Cable communications, via West Indies, is now open to Buenos Ayres and Chili, in South America, tariff for 20 words or less, in addition to the rate to Para, is \$22.00 and \$34.50, respectively, and half the twenty word rate for each additional ten or fraction of ten words.

Messages for Islay, Arica and Iquiqui in South America are forwarded by mail from Panama to Lima, and thence by telegraph to destination. Tariff from Lima: Islay, \$10.00 for ten words and one dollar for each additional word, Arica, \$15.00 for ten words, and \$1.50 each additional word, and Iquiqui, \$20.00 for ten words and \$2.00 each additional word, in addition to the rate to Panama. The words, "Wire Lima," must be inserted and charged for. Postage between Panama and Lima, is 37 cents.

The rates to places in South America south of Pernambuco was incorrectly given in last JOURNAL. The correct rates are as follows:

	Ten words.	Each additional words.	Ten words.	Each additional words.
Aspinwall.....	\$13.00	\$1.21	\$14.00	\$1.31
Bahia.....	30.00	1.58	31.00	1.63
Rio Janeiro.....	33.00	1.88	34.00	1.93
Santos.....	33.00	1.88	34.00	1.93
St. Catherine.....	33.00	1.88	34.00	1.93
Rio Grande do Sul.	33.00	1.88	34.00	1.93
Montevideo.....	33.00	1.88	34.00	1.93

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
NEW YORK, September 20, 1875.

To all Transfer Agents:

On October 11th, Laramie City, Wyoming, will be added to the list of money order offices in W. B. Hibbard's district.

Fort Shaw, Montana, has been discontinued as a money order office.

A. B. CORNELL,  
Vice-President.

The average time which the messages occupied in transit from Calcutta was 66 minutes, and from Bombay 56 minutes; the average time in transit of outward messages between London and India for the week ending August 1st, 1 hour 23 minutes; week ending August 8th, 1 hour 26 minutes; week ending August 21st, 1 hour 18 minutes; and week ending August 28th, 1 hour 22 minutes.

It is proposed in France by the telegraphic administration to encourage the introduction of private wires and to offer such inducements that no great factory and no rich man's house in the country will be without its wire.

# THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

ASSESSMENT NOTICE NO. 79, ISSUED OCT. 1, 1875.

## DEATH OF CHARLES H. VAWTER.

Charles H. Vawter, agent and operator at Sumner, Ill., while attempting to board a moving freight train, August 14, received injuries which resulted in his death two days later. Mr. Vawter held certificate No. 2007, issued April 26, 1873.

One dollar for assessment 79 is due from members holding certificates numbered up to and including No. 2,476.

## RECEIPT OF ASSESSMENTS.

NEW YORK, September 25, 1875.

### ASSESSMENT No. 79.

21, 64, 131, 138, 208, 211, 217, 271, 277, 301, 352, 447, 464, 509, 564, 615, 622, 742, 843, 859, 911, 915, 917, 941, 943, 991, 1024, 1154, 1169, 1178, 1185, 1199, 1268, 1333, 1357, 1407, 1490, 1502, 1503, 1516, 1527, 1832, 1862, 1957, 1970, 1986, 2026, 2050, 2066, 2147, 2236, 2240, 2303, 2346, 2389, 2390, 2400, 2421, 2423, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486.

### ASSESSMENT No. 78.

54, 67, 72, 98, 114, 121, 122, 129, 141, 142, 143, 144, 173, 176, 177, 178, 184, 188, 201, 202, 220, 247, 254, 274, 276, 278, 279, 281, 292, 293, 295, 360, 367, 379, 381, 398, 402, 431, 477, 533, 545, 546, 566, 573, 592, 600, 603, 604, 617, 618, 667, 678, 680, 685, 734, 735, 740, 751, 756, 791, 831, 855, 858, 871, 874, 883, 922, 929, 952, 998, 1001, 1023, 1040, 1054, 1072, 1074, 1076, 1085, 1088, 1090, 1143, 1156, 1173, 1205, 1217, 1224, 1226, 1232, 1267, 1274, 1276, 1295, 1304, 1325, 1329, 1358, 1364, 1365, 1368, 1402, 1403, 1404, 1410, 1426, 1440, 1482, 1518, 1537, 1550, 1554, 1555, 1560, 1562, 1576, 1582, 1589, 1593, 1594, 1596, 1615, 1619, 1634, 1635, 1656, 1672, 1676, 1681, 1697, 1698, 1707, 1721, 1723, 1736, 1745, 1773, 1775, 1787, 1791, 1798, 1799, 1810, 1811, 1812, 1847, 1869, 1907, 1915, 1916, 1922, 1924, 1926, 1938, 1942, 1951, 1953, 1972, 1991, 1999, 2000, 2001, 2005, 2015, 2019, 2022, 2024, 2027, 2028, 2044, 2045, 2048, 2067, 2065, 2069, 2114, 2118, 2119, 2136, 2141, 2143, 2172, 2175, 2181, 2191, 2197, 2199, 2201, 2204, 2205, 2206, 2212, 2214, 2216, 2220, 2221, 2230, 2231, 2243, 2248, 2250, 2263, 2265, 2272, 2280, 2295, 2296, 2297, 2298, 2300, 2301, 2322, 2330, 2331, 2333, 2334, 2335, 2348, 2349, 2350, 2366, 2373, 2374, 2378, 2379, 2385, 2392, 2393, 2394, 2415, 2431, 2435, 2439, 2441, 2447, 2453, 2455, 2457, 2471, 2476.

### ASSESSMENT No. 77.

6, 39, 171, 175, 228, 248, 273, 294, 347, 441, 542, 556, 557, 605, 692, 701, 710, 722, 733, 766, 781, 783, 786, 801, 802, 809, 836, 838, 908, 926, 944, 980, 1000, 1002, 1014, 1016, 1041, 1069, 1134, 1136, 1141, 1207, 1255, 1256, 1281, 1283, 1284, 1285, 1286, 1339, 1340, 1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1366, 1405, 1421, 1427, 1428, 1430, 1432, 1433, 1465, 1469, 1471, 1474, 1476, 1481, 1513, 1573, 1586, 1609, 1616, 1649, 1666, 1700, 1704, 1718, 1737, 1746, 1747, 1785, 1802, 1828, 1854, 1863, 1982, 2023, 2063, 2065, 2112, 2128, 2182, 2227, 2261, 2277, 2284, 2286, 2292, 2293, 2299, 2325, 2326, 2360, 2364, 2365, 2369, 2380, 2382, 2395, 2398, 2399, 2401, 2425, 2446, 2463.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

## THE ANNUAL MEETING.

The annual meeting of the Telegraphers' Mutual Benefit Association will be held on Wednesday, November 10, 1875, at 7:30 P. M., at the general office of the Western Union Telegraph Co., corner Broadway and Dey street, New York.

A full attendance is desired. Those who cannot be present should be represented by delegates or by letter, so that a full expression may be had of the different views in the interest of the association.

In a paper read before the Auckland Institute on the best route for a submarine cable between Australia and New Zealand, Dr. Purchas gives a preference to the route from Botany Bay to Ahipara Bay, near the North Cape, Auckland. The bay, he stated, was easy of access, sandy, and sheltered from a current which swept round the North Cape, the soundings showing an average of 750 fathoms along a ridge which seemed to extend from the North Cape right across to Australia. One fatal objection to the route from Botany Bay to Cape Farewell was that soundings which had been made showed the enormous depth of 2,600 fathoms. The cable would also land on the wrong side of Cook's Straits, the seat of Government being on the opposite side.

# CORRESPONDENCE.

To the Editor of the Journal of the Telegraph:

The general impression was that the Directory recently issued, was intended as a Tariff Book for offices, but upon inquiry it was found that it was intended only for customers. This was a great disappointment (not as regards the Directory, as it could not be used as a tariff book), but that the long looked for new tariff book was not on hand. The condition of our book (notwithstanding the necessary amount of care) is very bad, beyond the possibility of its reconstruction. So bad, that the operators would rather handle a battery, than look out a tariff. Have no doubt there are many in a like condition. We hear there is a new one talked of; will the Editor please shed some light on the subject. I offer the following suggestions for the new book, which I think would be improvements. A column headed "Post Office address or Changed to." The Remarks column, at least double the width of present one; directions at bottom page, each State, as to which are half rate offices. Lastly and most important, a sufficient number of blank pages (at the end of each State for the entry of new offices), as to prevent the necessity of pasting in leaves, which destroys the form and neatness of the book. To be half as large again as the present one, and to contain the rules of the Company, as well as all information necessary for receivers. Will some managers speak up and help this matter along?

MANAGER.

[Our correspondent is mistaken as to the Directory being for the use of customers exclusively. Also as to the idea that it cannot be used as a tariff book. The fact is that it is the most perfect book of rates ever devised, as well adapted for the telegraph office as for a counting-room. If the old book now in use is unfit for further service, a new one can be obtained by requisition in the usual manner. The suggested improvements will be duly considered. Ed.]

CAMBRIDGE, MD., September 16, 1875.

To the Editor of the Journal of the Telegraph:

Please give me a little information in regard to the following. A party steps in a telegraph office and sends a message to a party here, asking information, and tells the party to answer at another office a few miles ahead, as he is traveling. The message is received here and delivered, and the answer is sent collect to the other office, but before it reaches the office this party has arrived and asks if there is a message there for him. On being informed there was not he leaves, after which the message is received and, therefore, cannot be delivered. Which office is responsible for the charge. Should the answer have been guaranteed? By answering immediately you will greatly oblige

MANAGER.

Answer—The message should have been prepaid or guaranteed. It was not an answer within the rule.

BALTIMORE, September 20, 1875.

To the Editor of the Journal of the Telegraph:

In a rush of business at the Receiver's window should or should not precedence be given to paid over collect business? An Executive order issued soon after the Chicago fire reads: "In all cases give precedence to paid business." Does the order apply to all business? Please reply through next JOURNAL.

DAY RECEIVER.

Answer—As all messages are either prepaid or guaranteed, no distinction can be made. The executive order referred to has no bearing whatever upon the case. It was framed to meet an emergency and died when that emergency ceased. It is difficult to see how it could be understood in any other manner.

To the Editor of the Journal of the Telegraph:

Party at Hanover, Pa., sends a message to this place to his wife, requesting her to send reply to Harrisburg, Pa. The message was sent to that place, but party could not be found. Now, I want to know who is responsible for the message? Please give your opinion through the JOURNAL and oblige

VIRGINIA.

Answer—You are responsible.

To the Editor of the Journal of the Telegraph:

A government official presents a message for transmission the body of which reads: "Please meet my wife at the depot to-morrow," and requests it sent at "government rates." Should it be accepted as a government message? It is evident that it is not government business. Is it the duty of an operator to send everything and anything that a government official may present for transmission, at government rates?

PHIL.

Answer—Full and complete instructions for the treatment of all classes of messages offered as government business was given in the JOURNAL of August 15, 1874. As the proper course to be pursued in a case of this nature we read that "whenever a message is presented by an officer of the government to be sent at government rates which the manager of the office has reason to think is not upon government business, he is authorized to request the person presenting it to endorse upon it the word official, for the transmission of which no charge will be made. In case of refusal to endorse the word official on the message, the manager will accept and transmit the message and report the facts to the Superintendent.

## FOREIGN ITEMS.

The Directors of Hooper's Telegraph Works announce that, owing to the absence of new contracts since the first of January, they have decided not to pay an *ad interim* dividend for the half year ending the 30th of June last. It is added, however, that negotiations are pending for several important contracts, and that one of considerable magnitude has been provisionally arranged.

The traffic receipts of the Eastern Extension Australasia and China Telegraph Company for the month of August last, amounted to £30,072, and for the corresponding month of 1874, to £19,697.

The traffic receipts of the Brazilian Submarine Telegraph for the month of August last, amounted to £10,032, as against £9,761 for the corresponding month of 1874.

The traffic receipts of the Eastern Telegraph for the month of August last, amounted to £30,005, and for the corresponding month of 1874, to £31,265.

The traffic receipts of the Great Northern Telegraph for the month of August last, amounted to 385,001fr., and for August last year, to 415,383fr. The total traffic receipts from the 1st of January to the 31st of August amounted to 2,794,859fr. (£111,794); last year 2,902,109fr. (£116,084).

The traffic receipts of the Direct Spanish Telegraph for the month of August last, amounted to £1,773, against £1,282 in the corresponding period of last year. The average time occupied in the transmission of telegrams between Madrid and England via Santander during the month of August, was 3 hours 4 minutes (including transmission over Spanish land lines.

The number of messages sent over the Cuba Submarine Telegraph Company's lines during the month of August, was 2,279, estimated to produce £2,800, against 1,750 messages, producing £1,622 in the corresponding month of last year.



## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,  
Western Union Telegraph Company.  
195 Broadway, New York.

NEW YORK, OCTOBER 1, 1875.

The annual meeting of the stockholders of the Western Union Telegraph Company for the election of officers for the ensuing year and such other business as may come before it, will be held at the Western Union Building, in this city, on Wednesday, October 13th.

The Quarterly Dividend of two per cent declared by the Western Union Company from the net earnings of the three months ended September 30th, is payable at the office of the Treasurer of the Company on and after October 15th, to shareholders of record at the closing of the books on September 20th.

Notwithstanding the notice concerning postal cards which appeared in the JOURNAL of September 1st, some employes still persist in writing matter other than the address, upon the face of the card. This extra matter, be it a date or anything else, subjects the card to a charge of six cents, which is double full letter postage, and this is collected on delivery, from the party addressed. It should be distinctly understood that nothing whatever, except the address, should be written on the face of a postal card.

On and after Monday, October 4th, the rate per word to Great Britain, Ireland and France, will be one dollar from all points in Nova Scotia, New Brunswick, the New England States, and from New York City. From all points in New York (except New York City), New Jersey, Pennsylvania, Delaware, Maryland and District of Columbia, \$1.03. From all points in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan and Wisconsin, from St. Louis, Mo., and the Western Union Company's offices in Florida, \$1.15. From all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dacotah, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada, California, Arizona Oregon and Washington Territory, \$1.90. From British Columbia, \$1.35. These rates are in gold.

### THE EGOTISM OF IGNORANCE.

We published in our last issue that portion of the inaugural address of Sir John Hawkshaw, the newly elected President of the British Association for the Advancement of Science, in which he professed to outline the history of the electric telegraph.

The Society numbers among its members some of the foremost scientists of the day. It stands prominent in the front rank of similar bodies in the world of civilization, and its discussions, deliberations and decisions are read and regarded as authoritative by learned men in all countries.

The address of Sir John Hawkshaw, so far as it relates to telegraphy, is chiefly remarkable for what it does not contain. In no country more than the United States is the great truth acknowledged that science has no nationality—that it is cosmopolitan—and until this remarkable production appeared, and for which its author received the official thanks of his associate members, it was hoped that the scientists of Great Britain were in no whit behind in their acknowledgement of what was due to those who worked in the same field, but who, in the eyes of the average Briton, labored under the disadvantage of not being born on British soil.

Comparisons are odious; yet we believe that the names of American discoverers and inventors which are comprised in the term "others" and tacked on to the tail end of the name of Sir Charles Wheatstone, will compare favorably with any furnished by Europe, and particularly by Great Britain, in the unparalleled advancement of electrical and telegraphic science which the last quarter of a century has witnessed.

If the British Association for the Advancement of Science cares to retain its conceded hitherto high position, it will not in the future endorse by its action, and father with its name, the utterances of men, however elevated in its councils, until it is reasonably certain that such utterances are up to the standard of its established reputation. "Cramming" for the occasion, if necessary, should be undertaken only under the direction of a judicious and unprejudiced mentor. If such a one can be found in Great Britain the Association would do well to attach him to its service. In some manner, however, the Association should hereafter endeavor to spare itself the shame and mortification of officially endorsing such remarkable examples of ignorant egotism. The true advancement of science will be better secured by giving credit where credit is due, and this, as we understand it, is one of the means by which the professed objects of the organization are supposed to be carried out.

### PROTECTION OF TELEGRAPH LINES FROM LIGHTNING.

Superintendent C. G. Merriweather of the fourth district in the Southern division, reports that the experience of the past season has proved conclusively that the application of lightning rods to telegraph poles is a matter whose importance should lead it to receive careful attention. On many routes

under his charge, where a large number of poles were formerly destroyed by lightning every year, a dozen or more being sometimes shattered in a single day, the attachment of lightning rods has resulted most favorably, not a single pole having been damaged during the present season. He also states that no trouble has been experienced from accidental contact between the lightning rods and the line wires, although serious apprehensions were entertained that this would prove an obstacle to their successful use. The rods were placed on every tenth pole, and also on the nearest pole on each side of every office.

### THE FRANKLIN TELEGRAPH COMPANY.

At an adjourned annual meeting of the stockholders of the Franklin Telegraph Company, at Boston, September 15th, in the absence of a regular official report of the business transacted during the previous year, a memorandum was presented by the Secretary of the Atlantic and Pacific Telegraph Company which the meeting (ten persons in all), must have found very interesting reading. The receipts for the year ended April 30th, 1875, footed up to \$290,156. For some reason the working expenses were not given, but they must at least have been equal to the receipts, for the memorandum afforded the information that down to April 30th, the managers (directors and officials of the Atlantic and Pacific Co.) in their private capacity, had borrowed \$26,652 from the Atlantic and Pacific Company as a corporation, for the construction and purchase of new lines, and that since that time an additional sum of \$24,733.08 had been borrowed from the same company for "improvements and new lines." The memorandum closed with the statement that notwithstanding the loss of Government business and the debt of \$51,000 created, the prospects for the Company were never more favorable.

If those unfortunate stockholders who are in the minority can derive any comfort from the prospects foreshadowed by that memorandum, it can only arise from the contemplation of that unknown element of value set down as "improvements."

### THE GOLD AND STOCK COMPANY.

The annual meeting of the stockholders of the Gold and Stock Telegraph Company was held at their executive office in this city on Tuesday September 28th. The following named gentlemen were elected Directors for the ensuing year; William Orton, Norvin Green Tracy R. Edson, James H. Banker, Marshall Lefferts, Alonzo B. Cornell, Henry R. Pierson, George B. Prescott and Augustus Schell.

At a subsequent meeting of the Board of Directors, Marshall Lefferts was reelected President, George B. Prescott, Vice-President, and Henry H. Ward, Secretary and Treasurer.

The Direct cable is again in trouble. A break has occurred in the deep sea portion off Newfoundland. A repair ship is said to have started for the spot, but it is expected that it will take thirty days to repair the damage.

## THE TELEGRAPH IN PERU AND CHILI

Under date of Sept. 5th, the *New York Herald's* correspondent at Lima, Peru, writes concerning telegraph matters in Peru, Chili, and Bolivia as follows: The *Dacia* and *International*, steamers in the service of the L. R., G. P. and Telegraph Works Company have successfully concluded their work on the coast, and a submarine cable now connects Chorrillos, a watering place nine miles from Lima, with Caldera in Chili, whence telegraphic communication may be had, via Valparaiso and Santiago, with Buenos Ayres and Montevideo, and from these last named cities to Europe and North America by way of Rio Janeiro, Bahia and Lisbon. The coast line touches at Mollendo, Arica and Iquique, passing then to Bolivian territory at Cobiya, and thence to Caldera. The first messages were despatched by Mr. Pardo to the Presidents of Chili and the Argentine confederation, and to the Emperor Dom Pedro, of Brazil, congratulating them upon the new link established between the respective countries. The enterprise should prove to be a profitable one, but the tariff now fixed is so excessive that the privileges afforded by the cable are, *ipse facto*, placed beyond the reach of the great majority of merchants. Even for despatches between the coast stations of Peru a charge of twelve hard dollars for ten words is exacted, making correspondence more than expensive. A curious feature is to be noticed, however. The Minister of the Interior, in a circular addressed to the different prefects, subprefects and other officials of the government in the South, orders them in their communications sent over the wire to suppress all ceremonious terms, and even to address the President of the Republic as a simple, private citizen, leaving out the interminable "Your Excellency" and "May God keep you under his protection for years to come." It is shrewdly suspected here that this order of the Minister is by no means agreeable to the telegraph company, as their profits will be notably diminished thereby; but the wishes of the Secretary are paramount.

## MAJOR BARNEY'S INVENTION.

In our number for the 16th of April last we made mention of a new system of rapid and simultaneous telegraphy, the invention of Major Barney, an American, which had been tried on the Government lines and found to give very satisfactory results.

Since that time, agreeably to Mr. Barney, some modifications have been made in the system by Mr. Godener, a Frenchman and pupil of Bréguet, and later experiments have given still more satisfactory promise than those made at first. The following are some of the results:

On the 1st of July, the same dispatch was transmitted simultaneously to Ostend and Antwerp from Brussels, with a velocity of 600 words a minute. These trials took place on the lines between Brussels and Ostend and Brussels and Antwerp, the lines having been joined at Brussels in order to obtain increased length of circuit; the first was 156 miles, and the second about 57 miles long.

July 17th, messages were sent from Ostend to Brussels with a velocity of 1,092 words per minute (all being read by the employes present).

August 25th, messages were transmitted from Brussels via Arlon and back, a distance of about 237 miles, at a velocity of 600 words per minute and read by the employes of the office.

There is reason to congratulate the railroad, post and telegraphic administration for having, in the interest of science and progress, placed their lines at the disposal of the experimentors.—*L'Independence Belge*.

## ELECTRICAL SCIENCE IN CHINA.

Last year, during the height of the excitement caused by the anticipations of war with Japan, the Imperial authorities gave directions to establish a college for the instruction of a staff of Chinese in the science of torpedo engineering.

An extensive building has been secured near the city of Foochow, admirably situated on the river Min; about forty students got together, and a large supply of the latest and most approved torpedo apparatus, manufactured by the Silvertown Telegraph Company, sent out. Some of the instruments are most beautiful specimens of the application of electrical science to modern submarine warfare; indeed the whole of the plant is identical with that at present used by our Royal Engineers at Chatham and elsewhere. The services of Mr. J. A. Betts, M.S.T.E., have been secured as Engineer-in-Chief. Mr. Betts was formerly in the torpedo department of the Silvertown Telegraph Company, and left England in October last.

The course of instruction will include the manufacture of torpedoes, mooring and placing them in position, the use of the "firing arcs" in torpedoes fired by observation, lime-light signaling, etc. A class will also be formed to receive instruction in practical telegraphy, testing, etc.

Active operations are being carried on at the arsenal, inside the city, for the manufacture of the mechanical parts necessary for the completion of a large stock of torpedoes; the electrical stores will of course be supplied from England.

What with the satisfactory arrangement of the dispute between the Chinese Government and the Great Northern Telegraph Company, concerning the Foochow-Amoy telegraph line (in which Mr. Betts acted as arbitrator for the Chinese Government), and the formation of a corps of Torpedo Engineers, China would seem to be advancing, whether for good or evil to foreign interests remains to be seen.

The Indo-European Telegraph Company have issued a circular giving the new rules and regulations affecting the transmission of messages, which, having been adopted at the conference held in St. Petersburg, will come into force from the 1st January next. From and after that date messages of any number of words may be sent, the charge per word being uniform between India and all stations in Europe, except the Shetland and Orkney Islands and Russia. The same system has been adopted for messages originating in, or destined for, countries beyond India and Europe. The length of a word has been limited to a maximum of ten letters. Code words are not to contain more than a maximum of ten characters, in lieu of seven syllables as at present, and any excess will be charged for at the rate of one word for every ten letters, or fraction of ten letters. Artificially-constructed words not appearing in a dictionary will not in future be admitted. Each group of figures will be charged as one word if containing five figures or less; groups of more than five will be charged as so many words as they contain five figures, plus one word for the remainder, if any; but groups of figures, if manifestly used for code purposes, will cause the telegram to come under the heading of "secret messages," and subject it to compulsory registration. Groups of letters may be refused altogether by any administrations, but if admitted they will be charged the same as groups of figures. Any combination of code employing in the same message groups of figures and letters is strictly prohibited, and telegrams so composed cannot be accepted. Addresses may be written in code at sender's risk, under arrangement with the administrations concerned. The signature may also be

a code word, or the last word of the message may replace it. Abbreviated forms for expressing "reply paid," "acknowledgment of receipt," of "registration," "telegram to follow," etc., have been agreed to, so that only one word need be paid for to convey these instructions. The *via*, or indication of route, will be sent free of all charge.

"The duties of telegraph clerks in Australia," says the *Electrical News*, "would seem to be as strictly apportioned as in England, and mistakes are as vigorously punished. From a printed copy of the rules and regulations for the guidance of railway clerks in South Australia, we find that a fine of £100 is inflicted for divulging a message, or in default, imprisonment with hard labor for any period not exceeding six months. The rules apparently leave nothing unnoticed from the hours of attendance to the important duties of signaling trains. The clerk is provided with calls for 101 stations, instructions for charging the main and local batteries, the future signals to be used in inter-office communications relating to the general business and working of the line, and he is also provided with all the abbreviations."

Telegraphic communication has been opened with Gladstone, in the northern agricultural districts of South Australia.

## Business Notices.

## HOTEL ANNUNCIATORS.

The Western Electric Manufacturing Company of Chicago have lately completed the fitting up of the following hotels with the Needle Annunciator:

COOK'S HOTEL, Green Bay, Wis. 70 indications.  
TOWNSEND HOUSE, Oconomowoc, Wis. 120 indications.

ST. NICHOLAS Hotel, Lafayette, Ind. 70 indications.  
ROBERTSON HOUSE, Joliet, Ill. 80 indications.  
KIRBY HOUSE, Muncie, Ind. 60 indications.

The Western Electric Company is at present engaged in doing the Electric Annunciator work for the following hotels:

GRAND HOTEL, Indianapolis, Ind. 216 indications.  
ST. CHARLES HOTEL, Indianapolis, Ind., 60 indications.

WILER HOUSE, Mansfield, O. 50 indications.  
GLAEN HOUSE, Chicago. 50 indications.

The Girard House, Philadelphia, is to be fitted up with Electric Annunciators and Calls, preparatory to the Centennial year.

The proprietors have shown the good judgment to put this work into the hands of the Western Electric Manufacturing Company of Chicago, notwithstanding the fact that other parties were ready to do it at a lower price.

"The best is the cheapest" in Annunciators as well as other electrical apparatus.

The Girard House Annunciator will have three hundred and seventy-five indications, and is to be in operation about November first.

## TO THE HAIR.

WESTERN ELECTRIC MANUFACTURING CO., CHICAGO.

Dear Sirs: Please send me Culley's Handbook of Practical Telegraphy and Latimer Clark on Electrical Measurement.

I am pleased to see how exact you get the resistance in the instruments I have ordered. They are to the hair.

E. M. SHAPE,  
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**WANTED**—BY YOUNG MAN, A FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 70, Janesville, Wis.

**GLASS CARDS** RED, BLUE, WHITE  
Clear and Transparent.  
Your Name Beautifully  
Printed in GOLD on 1  
dozen for 50c. post paid, 3 doz. \$1. Must have Agents Everywhere. Outfits, 25c. Samples 10c. F. K. Smith & Co. Bangor, Me.

\$5 to \$20 per day at home. Samples worth \$1 free.  
STINSON & CO., Portland, Maine.



## OPERATORS' CHANCE!

Electrotype Cards, of Keys, Sounders, Relays, etc., with your name, handsomely printed on 25 assorted cards, for 25 cents, or 75 with name, business, etc. for 50 cents. Also R. R. Cards, samples of Electrotype Cards 3 cents. Agents allowed 25 per cent. to take orders for the finest and largest assortment of fashionable Visiting Cards, with Circulars, etc. mailed for 25 cents.  
F. P. MUNN,  
Address, Clyde, Wayne County, N. Y.

## ORTON'S PATENT PENCIL HOLDER.

This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS:

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 25 cents each. Sent by mail on receipt of price.  
Price per dozen, - - - - - 2.50.

GEO. H. BLISS & CO.,

CHICAGO, ILL.

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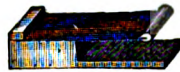
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Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

PRICE 75 CENTS.

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The following Steamers are appointed to sail from  
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Cabin, \$100.

Steerage and intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate, Passenger accommodations for all classes unsurpassed. For passage, rates of freight and other information apply to

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## Red Star Line.

Appointed to carry the Belgian and United States Mail.  
The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.

From New York.

VADERLAND...Oct. 12 STATE OF NEVADA...Sept. 30  
NEDERLAND...Nov. 5 SWITZERLAND...Oct. 23

FROM ANTWERP.

For Philadelphia.

For New York.

NEDERLAND...Oct. 12 SWITZERLAND...Sept. 30  
VADERLAND...Nov. 5 STATE OF NEVADA...Oct. 24

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - - - \$90. Second Cabin, - - - \$60

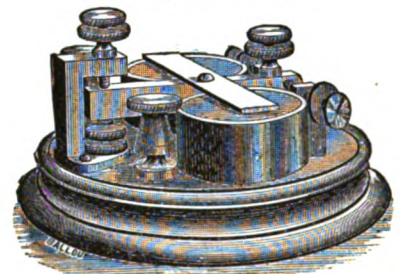
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This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

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Chicago, Ill.	Pittsburg, Pa.
Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass.	Quebec, L. I.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
Dayton, Ohio.	Indianapolis, Ind.
Elizabeth, N. J.	St. Louis, Mo.
Fall River, Mass.	St. John, N. B.
Fitchburg, Mass.	Springfield, Mass.
Hartford, Conn.	San Francisco, Cal.
Jersey City, N. J.	Savannah, Ga.
Louisville, Ky.	Syracuse, N. Y.
Lawrence, Mass.	Troy, N. Y.
Mobile, Ala.	Toledo, Ohio.
Montreal, Canada.	Toronto, Canada.
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involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

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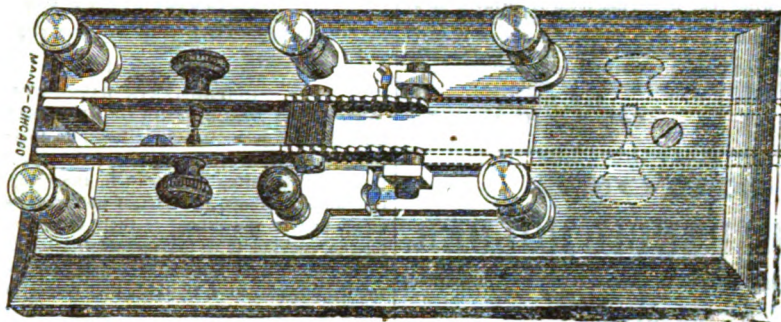
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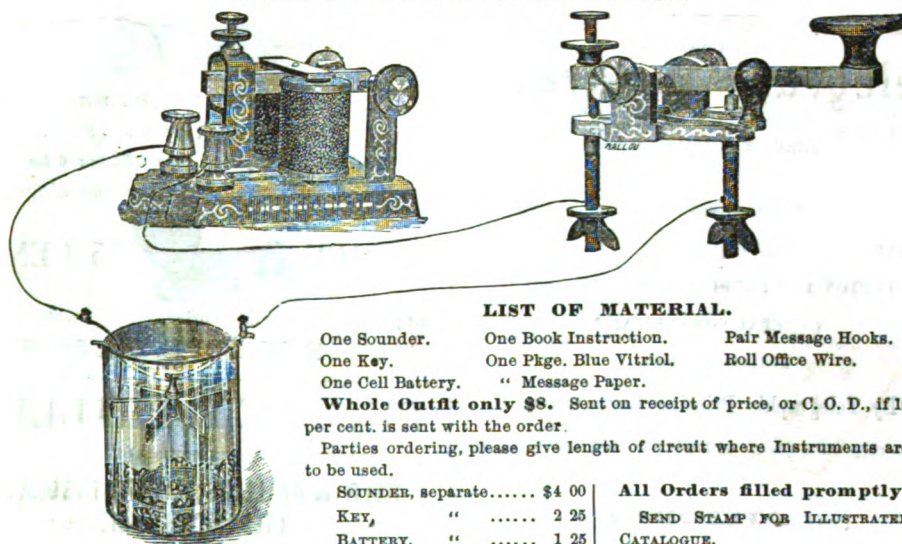
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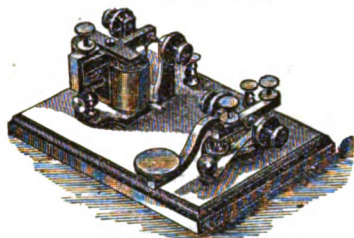
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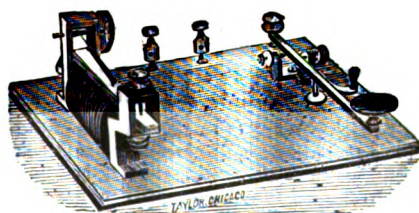
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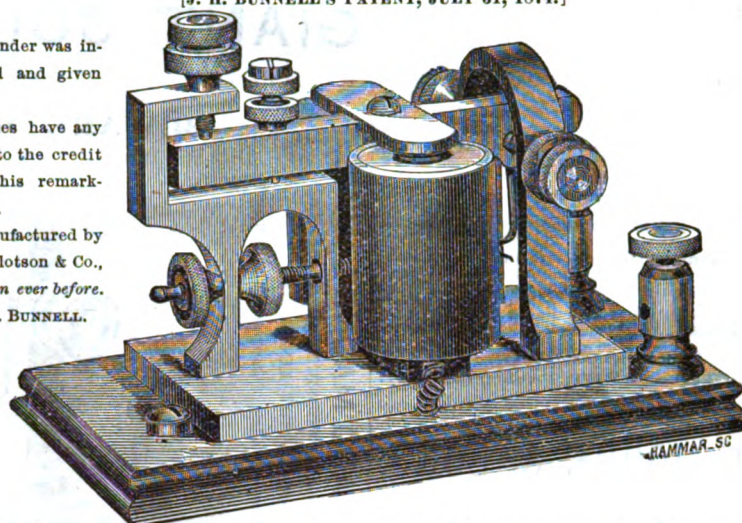
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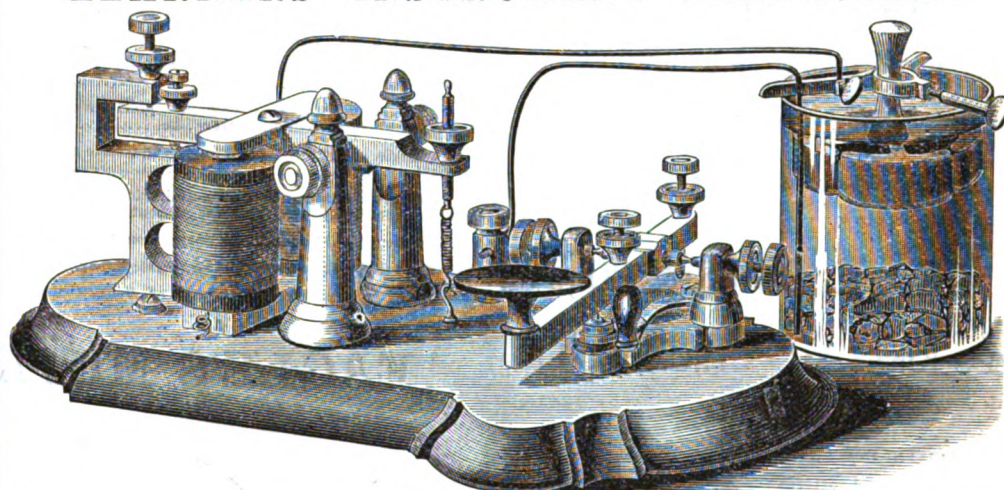
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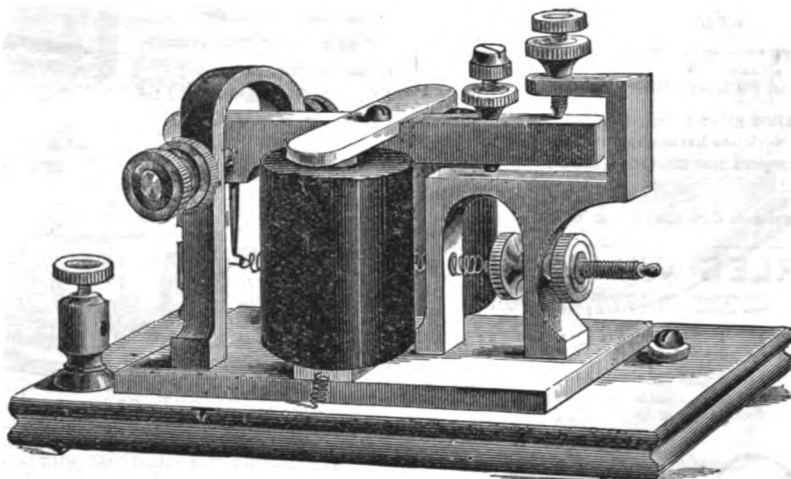
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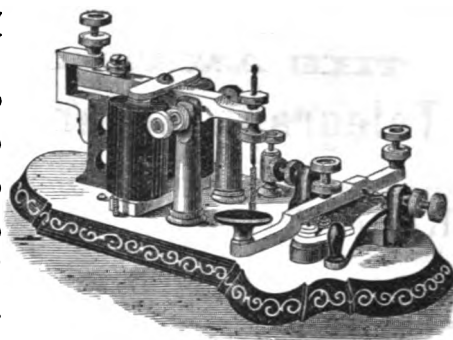
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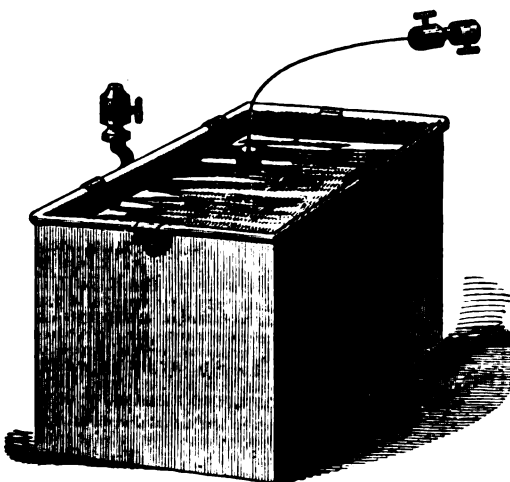
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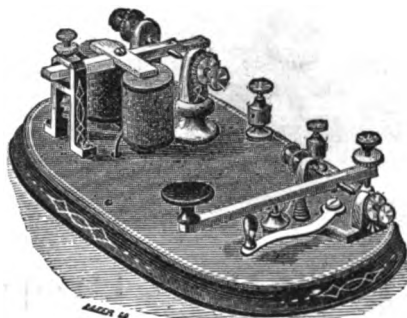
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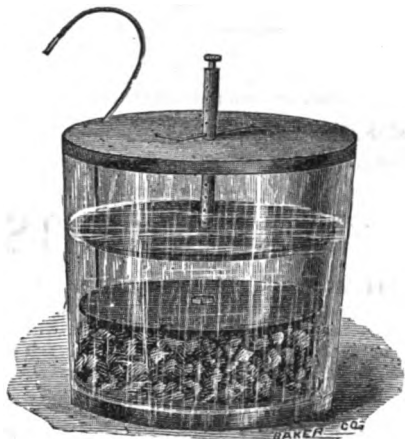
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This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

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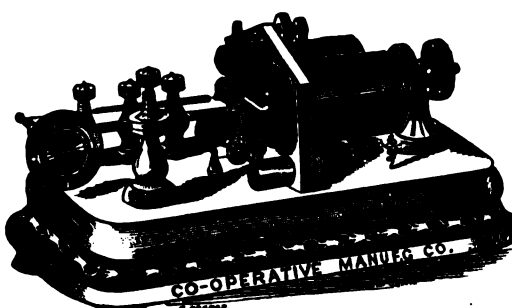
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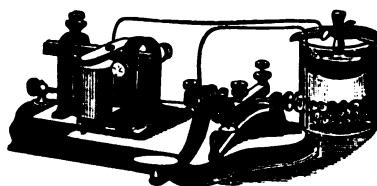
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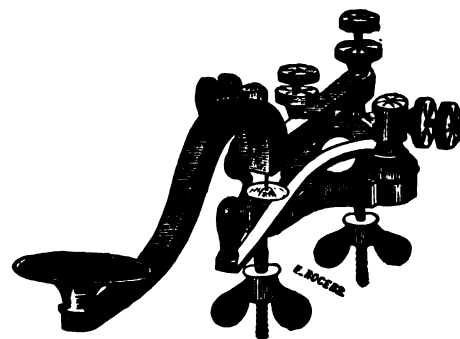
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N. B.—Either of the above Instruments can be made to work on a circuit from one to twelve miles by Winding Magnet with fine wire which will make cost of Instrument one dollar extra.

Send for Price List.

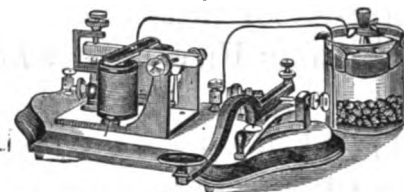
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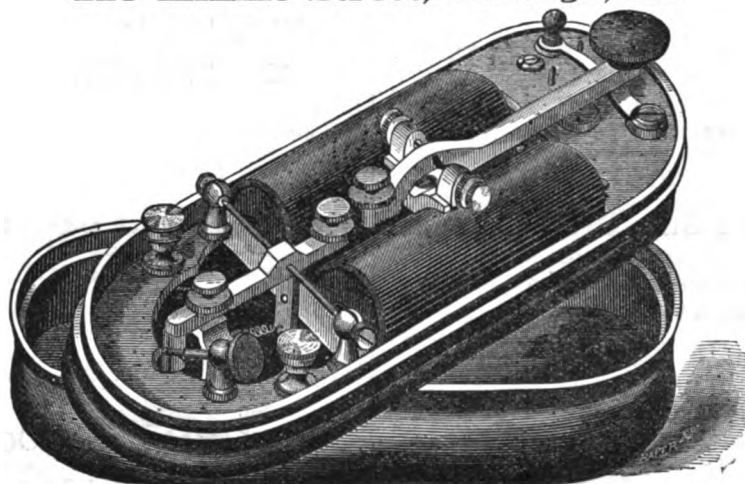
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It is pronounced the best finished and most serviceable Pocket Instrument made.

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Cost lessened by dispensing with large accumulations and abolishing Agents' commissions.

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Life Insurance stripped of non-essentials and made as plain as Fire Insurance.

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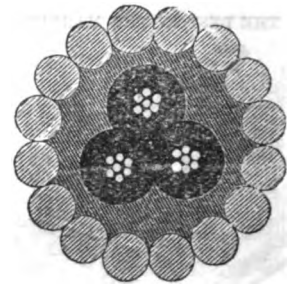
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RUBBER CLOTHING CO., 363 Broadway,

D. HODGMAN, 27 Maiden Lane,

SHEPARD & DUDLEY, 160 William St.

Address all communications to S. BISHOP,

OFFICE AT FACTORY.

O. L. SMITH & BRO., PRINTERS, 21 Spruce Street, N. Y.



# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 20.

NEW YORK, OCTOBER 15, 1875.

WHOLE NO. 191.

## ANNUAL REPORT OF THE PRESIDENT OF THE WESTERN UNION TELEGRAPH COMPANY TO THE STOCKHOLDERS.

To the Stockholders of the Western Union Telegraph Company:

The following report of the operations of the Company for the fiscal year ended June 30, 1875, is submitted pursuant to the requirements of the By-laws.

The gross receipts for the year from all sources, except proceeds of bonds, were \$9,564,574.60; the gross expenses were \$6,335,414.77; the difference \$3,229,159.83 being net profit. All sums paid as rental for leased lines are included in the gross expenses.

Compared with the preceding fiscal year, there was an increase in the gross receipts of \$301,920.62; a decrease in the expenses of \$420,319.06; and an increase in the net profit of \$722,239.68.

There were in operation at the end of the year 72,833 miles of line, 179,294 miles of wire, and 6,565 offices.

The number of messages transmitted during the year were 17,153,710, being an increase of 824,454 over the preceding year.

The capital stock of the Company is \$41,073,410, of which the Company owns, and now has in the treasury \$7,285,935. The difference, \$33,787,475, is the amount of the capital stock outstanding, which has been increased \$1,800 during the year by the issue of 18 shares in exchange for the stock of companies leased to the Western Union, and which have small amounts of capital outstanding on which interest is paid as rental.

The bonded debt of the company, July 1, 1874, was \$5,946,900, of which \$1,498,000 is the seven per cent. gold building bonds, and \$4,448,900, seven per cent. currency bonds, which mature November 1, 1875.

To provide for the redemption of the bonds falling due in November, 1875, it was decided, in January last, to issue sterling bonds bearing six per cent. interest in gold, to an amount which would produce about \$5,000,000 in currency, and arrangements were made for the sale of these bonds at 95, which it was confidently expected, would result in disposing of the entire loan in Europe. But after purchasing these bonds, amounting to \$1,001,160, the parties with whom the arrangement had been made, availed themselves of an option in the agreement to cancel it. Subsequently, it was decided to offer the remainder of the issue in seven per cent. currency bonds at 95, and the whole amount was subscribed for within a few days. The entire issue of new bonds will amount to \$5,001,160, and the product to \$4,751,102 in currency, of which sum \$4,448,900 will be applied, so far as it has not been done already, to the redemption of the bonds, amounting to that sum, which mature November 1st next, and the balance, \$302,202, will go to income account to restore a portion of the disbursements on that account, for the

new building in excess of the loan. As the bonds maturing on the first of November are now in process of redemption, and the subscriptions to the new bonds are payable at the option of the subscriber at any time before November first, it is difficult to state the exact present condition of the bonded debt account. But when the pending transactions are completed the whole bonded debt will stand as follows:

Seven per cent. gold (dollar) building bonds, due May 1, 1902	1,498,000 00
Six per cent. sterling bonds, due March 1, 1900	1,001,160 00
Seven per cent. currency bonds, due May 1, 1900	4,000,000 00
	\$6,499,160 00
Less amount of sinking fund held by the Union Trust Company, trustees	87,800 00
Total funded debt	\$6,411,360 00
The net profit of the year	\$3,229,159 83
has been applied as follows:	
For four Quarterly Dividends of 3 per cent. each on Capital Stock outstanding (inclusive of that payable July 15, 1875)	\$2,702,354 00
For interest on bonds	424,834 18
	3,126,688 18
Leaving a surplus for the year of	\$102,471 65
From which an additional appropriation of \$30,000 has been paid to the Union Trust Company as trustees for account of the Sinking Fund.	

The following statements show the profits and disbursements of the Company for nine years, from the date of consolidation:	
The surplus of Income Account July 1, 1866, was	\$275,357 24
The net profits for nine years, from July 1, 1866, to June 30, 1875, were	28,068,696 79
Making an aggregate, June 30, 1875, of	\$28,344,056 03
During which period there was disbursed:	
For dividends to stockholders (including dividend payable July 15, 1875)	\$8,235,167 24
For interest on the Company's bonds	3,159,831 18
	\$11,394,998 52
The balance	\$14,949,057 51
is represented as follows:	
Construction of new lines, erection of additional wires, etc.	\$5,373,143 45
Purchase of telegraph lines and of the stock of Companies controlled by the Western Union Co. on which interest or dividends are paid as rental	1,334,185 85
Western Union Stock (72,859 shares)	4,054,483 67
Gold and Stock Telegraph Co's Stock (47,710 shares)	1,173,509 00
International Ocean Telegraph Co's Stock (10,384 shares)	961,556 42
Anglo-American Telegraph Company's Stock (£1,308)	10,000 00
Central District and Printing Telegraph Company's Stock (200 shares)	10,000 00
Western Electric Manufacturing Company's Stock (500 shares)	39,000 00
Western Union Bonds (redeemed and cancelled)	1,072,345 00
Sinking Fund—Broadway and Dey Street Mortgage Bonds (amount not yet used for redemption of bonds)	87,800 00
Real Estate (New York City and elsewhere)	\$2,544,887 75
Less amount provided from the proceeds of bonds	1,802,202 00
	742,685 75
Miscellaneous	90,348 94
	\$14,949,057 51

## THE INTERNATIONAL OCEAN TELEGRAPH COMPANY.

The capital stock of this company is \$1,500,000, represented by 6,500 shares of preferred stock, entitled to dividends at the rate of 15 per cent. per annum, and 8,500 shares of common stock. The

Western Union Company own \$499,900 of the preferred stock, and \$478,500 of the common stock. Total, \$978,400.

The I. O. T. Co. also has the following liabilities outstanding:

BONDS.	
Bonds of 1878, issued July 1st, 1873, 5 years' Interest, 7 per cent. Gold, due semi-annually	\$184,000
Bonds of 1879, issued April 1st, 1869, Interest, 7 per cent. Gold, payable November 1st and April 1st	78,900

SCRIP.	
No. 1. Scrip Dividend to Common Stockholders, issued May 1st, 1869, Interest 7 per cent. Gold per annum, payable April 1st and October 1st, redeemable at thirty days' notice. (Notice issued August 27th)	56,000
No. 2. Scrip Dividend to Common Stockholders, issued April 13, 1870, Interest 7 per cent. Currency, payable yearly, October 1st; redeemable October 1st, 1879	68,000

The operations of the I. O. T. Company for the year ended June 30, 1875, have been as follows:

Receipts	\$396,932 83
Ordinary expenses	\$81,918 07
Reconstruction of Cables	53,150 43
	135,068 50
Net profit	\$163,864 33

which has been appropriated as follows:

Balance of loan from Western Union Telegraph Co. repaid	\$30,000 00
Interest on debt	27,831 78
Bonds purchased for Sinking Fund	9,400 00
Construction of new lines	4,642 40
Concession for Cable from Cuba and Porto Rico to the Bahama and Bermuda Islands	1,000 00
Expenditures on steamship Prof. Morse	7,019 78
Payments on account of new Cable between Key West and Punta Rasa	27,921 84
	127,815 78
	\$36,048 55

The balance, together with the surplus of the previous year, is on hand in the Treasury of the Company.

A portion of the surplus has been recently used to purchase and cancel the \$56,000 of gold interest-bearing scrip, and it is in contemplation to retire the currency scrip also.

In my last Annual Report reference was made to the possible necessity of putting down a new cable between Key West and Punta Rasa. That necessity became so pressing that in March last, at the request of the Directors of the I. O. T. Co., I proceeded to London mainly for the purpose of contracting for the construction and shipment of a new cable for that line, superior in quality to any that had been previously provided.

A satisfactory contract for the manufacture of the cable was made with the India Rubber Gutta Percha and Telegraph Works Company of Silvertown, according to specifications prepared by Sir Samuel Canning, under whose supervision the work was carried on, and in June last the completed cable was put on board the I. O. T. Co.'s steamer "Professor Morse," which had been ordered to London for the purpose of receiving it. The steamer sailed direct for Key West, but during her voyage the yellow fever broke out at that and other gulf ports. and, believing it unsafe to permit the vessel to go to Key West at that time, she was met on her arrival

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY.  
Broadway, cor. Dey street, New York, October 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Plantersville, Ala., reopened.  
Tuskegee, Ala., reopened.  
Montevallo, Ala., closed.  
Whycocomagh, C. B. I., reopened as a W. U. office tariff 30 cents more than Port Hastings, check direct.

Hall Valley, Col., closed.

Woodside, Del., closed.

Half rate messages may now be accepted for and received from Jacksonville, Fla., at half rates for BOTH this and "other lines." Heretofore half rate messages have been taken for Jacksonville, at "half rates for W. U. lines ONLY and full rates for "Other lines."

Camak, Ga., reopened.

Hogansville, Ga., reopened, square 257.

Elkville, Ill., closed.

Mt. Clare, Ill., closed.

Dean, Iowa, closed.

Deer Park, Md., closed.

Point of Rocks, Md., changed to Washington Junction.

Orient, Mich., changed to Sears.

Batesville, Miss., reopened.

Luray, Mo., reopened, square 388.

Messages for Jackson, N. H., can be delivered by special messenger from North Conway. Charges for delivery \$3.00.

Demarest, N. J., closed.

West End, N. J., square 41 in tariff book, is in Hudson Co.

Messages taken for Flemingsville and Tioga Centre, N. Y., will be mailed or delivered by train from Owego. Charges for delivery by train 75 cents, to Flemingsville and 50 cents to Tioga Centre.

Messages for Nichols, N. Y., are delivered by stage from Smithboro'. Charges for delivery, 25 cents.

Messages taken for Apalachin, N. Y., are delivered by special messenger from Campville. Charges for delivery, one dollar.

Mineral Point, O., closed.

Belleville, O., closed (second notice), messages for Belleville are mailed to destination from Lexington.

Business for Great Belt City, Pa., will hereafter be checked to Dik's Station.

Middleburg, Snyder Co., Pa., reopened.

Paschalville, Pa., closed.

The delivery charge of 25 cents for each message to Mercer, Mercer Co., Pa., will hereafter be discontinued.

Allen's Rancho, Texas, closed.

Mannington, W. Va., reopened, square 141.

Riverside, Wis., changed to Gratiot.

## SUMMER OFFICES CLOSED.

Sea Side Pavilion, Long Island, N. Y.  
Rockaway Beach, Long Island, N. Y.  
Gettysburg Springs, Pa. Messages for Gettysburg Springs will hereafter be delivered from Gettysburg. Charges for delivery, 50 cents.

Capon Springs, Va.

Healing Springs, Va.

Berkeley Springs, W. Va.

Sweet Springs, W. Va.

## NEW OFFICES.

338 Irvington, Ill.

358 New Salem, Ill.

473 Sargent's Bluffs, Iowa.

339 Bardwell, Ky.

85 Washington Junction, Md., formerly Point of Rocks (Magagers of offices should be careful not to confound this office with that of Relay House, Md., which has always been known to public as Washington Junction.)

137 Sears, Mich., formerly Orient.

47 Florence Iron Works, N. J.

\* Chichester, N. Y., 40 and 3 from Rondout.

222 Spring Valley, O.

496 Kingsbury, Texas.

141 Valley Falls, W. Va.

335 Gratiot, Wis., formerly Riverside.

## ATLANTIC CABLE.

The name of the "Place from" in Atlantic Cable messages is still transmitted re, in accordance with the order in

JOURNAL of September 15th, 1875. The order referred to has not been revoked.

The order recently sent to offices by telegraph, that private code and cipher messages should not be accepted for the Ottoman Empire, is hereby revoked. Such messages may now be accepted.

Messages may now be accepted for transmission by telegraph direct to Lima, Peru, in South America. Tariff, \$37.50 for ten words or less, and \$3.75 for each additional word more than the rate to Valparaiso, Chili.

## CUBA CABLE.

A new cable has been successfully laid between Key West and Punta Rassa. The extra charge of three dollars per message collected during the interruption of the old cable will hereafter be discontinued.

Offices which since the issue of the last JOURNAL were informed of the interruption of communication by cable between Santos and Santa Catherina, South America, are notified that the cable has been repaired. Cable communication between the places named is now complete.

The tariff on messages to Islay, Arica and Iquiqui, in South America, will hereafter be found by adding the rates for these places, given in the last JOURNAL, to the tariff to Aspinwall, from which place the messages for Islay, Arica and Iquiqui, are now to be mailed.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
New York, Oct. 14, 1875.

## EXECUTIVE ORDER, No. 163.

## GOVERNMENT MESSAGES.

Executive order No. 158 is hereby modified, as follows:

Official messages of officers or agents of the United States will hereafter be transmitted "paid" or "collect," as the sender may direct, priority being given them over all other business.

The tariff upon such messages will be twenty-five cents for twenty-five words or less, and one cent for each additional word, for each circuit of 250 miles, provided however, that no more than ten circuits will be charged for. Upon messages passing partly over the lines of this company, and partly over the lines of another company, the distance should be computed separately for each.

EXAMPLES: Upon a message of forty words from San Francisco to New York, 3,252 miles, the tolls will amount to \$4.00. Upon the same message from San Francisco to Bismarck, Dacotah (a point on other lines via Sioux City), the distance to Sioux City being 1,911 miles or eight circuits, and from Sioux City being 573 miles or three circuits; the tolls will amount to \$3.20 for this line, and \$1.20 for other lines.

All the words except the date and place where the message is filed, will be counted, and the distances will be computed by the tables of the Post office Department. If payment of a collect message is refused, delivery will be made, nevertheless, and a report of non-collection immediately made by mail to the Auditor only. Credit will be taken for the uncollected tolls in the monthly account current, and a copy of the message returned as a voucher.

This order does not apply to such weather reports as are transmitted over scheduled signal circuits, the manner of returning which is specially provided for.

Executive orders Nos. 125 and 144 are hereby revoked.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, October 12, 1875.

To all Transfer Agents:

On October 25th, Hopkinsville, Ky., will be added to the list of money order offices in G. W. Traub's district.

ALONZO B. CORNELL,  
Vice-President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

New York, October 11, 1875.

## ASSESSMENT No. 79.

4, 13, 16, 22, 23, 26, 28, 46, 53, 56, 58, 60, 75, 77, 82, 86, 88, 90, 91, 93, 99, 113, 140, 157, 179, 181, 269, 332, 372, 385, 391, 434, 438, 536, 544, 546, 547, 553, 575, 646, 672, 703, 708, 731, 740, 804, 830, 832, 839, 901, 922, 923, 952, 976, 1011, 1126, 1173, 1183, 1191, 1205, 1208, 1252, 1260, 1282, 1298, 1300, 1303, 1306, 1325, 1345, 1368, 1394, 1399, 1409, 1448, 1485, 1517, 1524, 1531, 1550, 1579, 1613, 1615, 1623, 1635, 1818, 1831, 1859, 1894, 1901, 1944, 1991, 1995, 2030, 2069, 2082, 2097, 2133, 2135, 2164, 2169, 2174, 2178, 2199, 2228, 2239, 2244, 2259, 2287, 2307, 2322, 2343, 2345, 2352, 2363, 2371, 2386, 2412, 2413, 2414, 2422, 2424, 2427, 2442, 2444, 2450, 2454, 2465, 2468.

## ASSESSMENT No. 78.

17, 19, 25, 33, 61, 70, 74, 76, 89, 95, 97, 101, 112, 120, 134, 154, 156, 158, 160, 164, 189, 190, 191, 193, 197, 198, 227, 230, 240, 244, 257, 286, 302, 334, 341, 342, 351, 356, 357, 362, 364, 366, 378, 382, 392, 393, 394, 405, 406, 411, 412, 413, 418, 425, 430, 456, 463, 478, 511, 512, 548, 552, 554, 574, 577, 584, 594, 597, 642, 648, 649, 652, 655, 661, 662, 663, 664, 665, 667, 669, 691, 694, 714, 717, 723, 724, 728, 729, 730, 780, 799, 800, 820, 821, 823, 848, 870, 876, 897, 905, 927, 934, 939, 942, 949, 954, 957, 959, 963, 964, 978, 979, 995, 1005, 1030, 1031, 1033, 1034, 1046, 1047, 1050, 1055, 1058, 1063, 1100, 1101, 1127, 1152, 1190, 1196, 1200, 1210, 1211, 1233, 1234, 1237, 1241, 1248, 1268, 1269, 1270, 1273, 1288, 1290, 1307, 1309, 1311, 1312, 1313, 1314, 1315, 1317, 1318, 1319, 1326, 1321, 1322, 1372, 1385, 1390, 1391, 1406, 1412, 1417, 1438, 1439, 1444, 1453, 1454, 1455, 1456, 1457, 1458, 1483, 1500, 1506, 1507, 1515, 1522, 1542, 1546, 1546, 1580, 1590, 1603, 1605, 1607, 1608, 1625, 1639, 1652, 1653, 1660, 1661, 1662, 1665, 1667, 1678, 1684, 1687, 1688, 1690, 1691, 1695, 1696, 1708, 1709, 1710, 1713, 1714, 1724, 1728, 1732, 1733, 1765, 1766, 1767, 1789, 1795, 1796, 1797, 1804, 1815, 1817, 1823, 1824, 1835, 1837, 1838, 1839, 1840, 1841, 1844, 1845, 1857, 1858, 1860, 1874, 1877, 1911, 1913, 1914, 1917, 1943, 1958, 1968, 1985, 1992, 1993, 1997, 2010, 2012, 2025, 2033, 2035, 2038, 2041, 2053, 2072, 2074, 2075, 2092, 2108, 2110, 2113, 2123, 2125, 2131, 2136, 2137, 2156, 2157, 2167, 2183, 2184, 2185, 2187, 2192, 2195, 2224, 2225, 2234, 2237, 2238, 2245, 2246, 2252, 2257, 2258, 2269, 2271, 2272, 2279, 2281, 2282, 2283, 2290, 2291, 2304, 2313, 2314, 2316, 2317, 2319, 2321, 2327, 2336, 2342, 2344, 2354, 2357, 2358, 2361, 2368, 2381, 2388, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2416, 2426, 2443, 2452, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2466, 2473, 2474.

## ASSESSMENT No. 77.

27, 51, 185, 186, 187, 237, 238, 242, 246, 258, 451, 453, 455, 457, 635, 697, 705, 1071, 1400, 1415, 1556, 1567, 1570, 1600, 1633, 1657, 1670, 1692, 1715, 1716, 1731, 1786, 1788, 1934, 1945, 1946, 1947, 1974, 1976, 1978, 1987, 1996, 2037, 2151, 2177, 2236, 2330, 2328, 2353, 2448.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

LITTLE BURLESQUE ON THE POSTAL TELEGRAPH SCHEME.—Some wag, out in California, has got up a petition to Congress to prohibit the sale of milk by individuals on the ground that exorbitant prices have been charged, and that unwholesome milk has been sold. It is proposed to have the government seize all milch cows, remunerate the owners thereof, and have the milk sold at post offices. In large cities the letter carriers could, in addition to their regular duties, deliver it without much additional trouble. Any cream that could be obtained from the milk while in the post offices would be the perquisite of the post masters.

Mr. James E. Moon, a well and favorably known telegraphist in New Jersey, has been nominated by the Democrats of Warren County, in that State, for the position of County Clerk.

## FOREIGN ITEMS.

Direct communication has been effected between Continental Italy and the Island of Sardinia, by means of the new submarine cable laid between Orbetello and Terranova. The nucleus of the cable consists of seven copper wires, covered with thin layers of gutta percha, alternating with thin layers of Chatterton's composition. The copper weighs 107 pounds, and the gutta percha 140 pounds per nautical mile. The length of the main portion of the cable is 106,016 nautical miles, besides two portions of 3 and 7 miles respectively, running along the coast.

The Anglo-American Telegraph Company announces the proposed payment of a dividend of 1 per cent. for the quarter ending September 30th, showing a reduction of  $\frac{1}{4}$ .

In the report of the Direct Spanish Telegraph Company, just issued, the directors state that the accounts for the half year ending the 30th of June last show a balance to the credit of profit and loss of £6,117. This sum is said to be sufficient to pay, after providing for the Ten per Cent. Preference, a dividend at the rate of 5 per cent. per annum on the ordinary shares, leaving a balance of £429; but inasmuch as the half-year ending the 30th of June last was commenced with a reserve fund of £703 (since absorbed in the repairs of the Santauder cable), the directors deem it prudent to recommend a dividend at the rate of 4 per cent. per annum on the ordinary shares, and to replace the above sum, together with a further amount of £305 to the credit of the reserve fund, in order to begin the current half-year with a total reserve of £1,011.

The traffic receipts of the Western and Brazilian Telegraph Company, telegraphed from Brazil for the four weeks ending the 27th of August, were £8,543 4s. 5d.

The directors' report to the thirty-sixth ordinary meeting of the Mediterranean Extension Telegraph Company, stated that the Board have much pleasure in stating that the cables and land lines of the company continue in perfect working order, and they were enabled to recommend payment of the half yearly dividend on the eight per cent. preference stock, less income tax, as usual; and of a dividend at the rate of three per cent. per annum, free of income tax, on the ordinary share capital of the company, payable on and after September 1. There will remain a sum of £500 13s. 4d. to be carried to the reserve fund, which will then stand £7,848 7s. 7d. Mr. H. Moore, the chairman, in moving the usual formal resolution for the adoption of the report, said the receipts were about the same as last half year, whilst the expenditure was about £100 less—although they had during that time to supply new instruments.

## THE DUPLEX IN FRANCE

Mr. J. B. Stearns has successfully introduced duplex working into France. The system he has inaugurated is capable of six combinations, viz: Morse single working, Hughes single working, Morse duplex, Hughes duplex, Morse-Hughes duplex, Hughes-Morse duplex. The bridge system is used, and the results upon the Hughes are very satisfactory, because it is found that the instruments work better duplexed than on the ordinary single method, from the fact that the outgoing currents do not pass through the home instruments, and therefore disturb them. Paris has been working to Havre uninterruptedly since the commencement of the year.—*The Electrical News.*

## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

August 1875.

## APPOINTMENTS.

W. Brooke, B'way & Dey st.	R. J. Nicourd, St. Louis, Mo.
T. G. McKenna, " "	D. H. Voorhees, " "
P. Mullarkey, " "	C. L. Snyder, " "
E. H. Murphy, " "	C. E. Smailes, " "
E. D. Morton, " "	R. K. Saunders, " "
F. M. Spinning, " "	Henry T. Small, " "
Geo. Richmond, G. Cen. Depot	John McCabe, " "
Thos. Burke, 889 Broadway	C. T. Bradley, " "
F. J. Gray, 520 Hudson st.	J. D. Belles, " "
Vincent Murphy, 1000 6th ave.	George Brice, " "
Lizzie Branch, Castle Garden	W. H. Austin, Cheyenne, Wyo.
T. Broadfoot, Salem, N. Y.	R. H. Bricknell, Kearney June.
J. H. Cummings, Albany, N. Y.	R. H. Hall, Camp Stambaugh.
S. W. Conklin, West Side Park	A. W. Brown, Ogden, Utah.
L. I.	W. J. Grier, Salt Lake.
E. Mesler, Rockaway, L. I.	W. H. Myers, Pittsburgh, Pa.
Mary L. Morris, Coloco, N. Y.	J. C. Mains, Belle Centre, O.
J. Mathews, Sea Side Pavillion	D. C. Shull, Cleveland, Ohio.
L. I.	T. H. Gould, " "
Emma Osborne, Yonkers, N.Y.	W. H. Lytle, " "
W. E. Sprague, Round Lake, "	C. N. Sander, " "
A. E. Train, Yaphank, L. I.	John Swartz, Kenton, " "
J. Walling, Creedmore, "	Wm. Eris-hausen, Toledo, O.
H. W. Woodward, Shelter Is-	Miss J. E. Trotter, Warren, O.
land.	J. A. McKenna, Cincinnati, O.
J. Moore, Rockaway Beach, L.I.	H. A. Smith, Catactock, N. Y.
A. B. Howe, Mt. Washington,	H. S. Haight, Crescent, "
N. H.	R. S. Coaus, Hammondsport,
M. Priest, Mt. Washington De-	N. Y.
pot N. H.	D. Bander, Pleasant Valley
S. L. Daying, Newbury Vt.	Wine Cellar.
C. R. Montague, Woodstock,	L. N. Duke, Lincolnton, N. C.
Vt.	J. R. Lively, North Mountain,
Miss S. E. Thayer, Boston, Ma.	Va.
E. J. O'Connor, " "	M. J. Taylor, Monticello, Fla.
F. A. Corey, " "	Cora Williams, Angola, Pa.
H. M. Williams, Kingston, R. I.	M. Higbee, Atlantic City, N. J.
Miss H. E. Wallace, Norwood,	J. W. Hyne, Bay Side, "
Mass.	J. W. Frankentield, Cockeys-
Miss Annie Harper, New Haven	ville, Md.
Conn.	B. F. Kirkwood, Goldsboro
J. L. Buskirk, Stony Creek, Ct.	(York Co.), Pa.
J. Corcoran, Jr., Springfield,	E. N. Baldwin, Linwood, Pa.
Mass.	O. F. Brown, Monahawken,
A. Helderfer, Burlington, Ia.	N. J.
E. H. Holyrod, Clinton, "	J. C. Little, Parkton, Md.
E. Nightingale, Dubuque, "	M. Mehaffy, Wayne Camp, Pa.
J. M. Bradley, Milwaukee, Wis.	R. L. Warren, Bloomfield, N. J.
J. M. Quigley, " "	J. R. Pendergast, Hyde Park,
H. Brenner, " "	Pa.
R. H. Gray, Muscatine, Ia.	R. C. McCready, Philadelphia,
A. F. Woodruff, McGregor, Ia.	Pa.
D. P. Boyd, Racine, Wis.	J. W. McAllister, Larkinsville,
Mrs. A. O'Connor, Chicago, Ill.	Pa.
G. F. Stewart, " "	C. D. Shepherd, Clinton, Ala.
R. C. Rankin, " "	C. L. Vorwell, Corinth, Miss.
C. Fredenburg, " "	C. Curtis, Danville, Tenn.
B. C. Richards, " "	M. Ford, Dyer, "
L. T. Baker, " "	J. P. Payne, Franklin, "
W. T. Down, Atchison, Kan.	J. M. Manire, Dickson, Tenn.
J. Leoni, Dennison, Tex.	G. H. Morton, Tallahoma, "
A. L. Smalls, " "	B. G. Ryan, Charleston, W.
W. W. Irvine, DeValls Bluff,	Va.
Ark.	J. S. Brainerd, Deer Park, Md.
S. D. Madeira, Forest City, Ark.	Peter Engle, New Windsor,
D. Campbell, Houston, Tex.	J. F. Forsner, Greenville, N.S.
C. P. Connelly, Jacksonport,	J. E. Simson, Horton Landing,
Ark.	N. S.
R. W. Kline, Shreveport, La.	

## RESIGNATIONS.

E. P. Colton, B'way & Dey st.	R. J. Forbes, Chicago, Ill.
J. Corcoran, " "	C. E. Smailes, Dennison, Tex.
J. Gibbon, " "	J. Levin, Atchison, Kan.
Maggie McConnell, " "	E. J. Davis, DeValls Bluff, Ark.
W. Brooke, " "	A. B. Lucas, Forest City, "
R. G. W. Dennison, G. Cen. D.	F. G. Gwynne, Houston, Tex.
E. Simmons, 689 Broadway.	W. W. Dillard, Jacksonport,
F. E. Wilcox, Brooklyn, N. Y.	Ark.
G. F. Stevens, 1000 6th ave.	M. S. Bacon, Kansas City, Mo.
H. R. Miller, Round Lake, N.Y.	D. S. Ryan, St. Louis, "
J. Goodenough, Merrick, L. I.	Thos. P. Wheeler, " "
B. Penney, Rockaway, "	H. S. Derring, " "
Geo. Woodworth, Albany, N. Y.	John McCabe, " "
J. W. Elkins, Salem, "	J. D. Beall, " "
N. L. Miner, Newbury, Vt.	A. B. Mangering, " "
Miss M. P. Clifford, Norwood,	P. Grischoit, " "
Mass.	B. K. Saunders, " "
S. M. Ballou, Kingston, R. I.	Ross Roemer, " "
F. K. Allison, Woodstock,	J. A. Sponagle, Topeka, Kan.
Vt.	Thos. Kehoe, " "
F. A. Frabant, New Haven, Ct.	W. H. Emery, Cheyenne, Wyo.
F. E. Moulton, Stony Creek, "	J. A. Fisher, Kearney Jct., "
W. M. Corbett, Springfield,	F. Drake, Salt Lake, Utah.
Mass.	H. W. Shriver, Cleveland, Ohio.
A. J. Holden, Charlestown, Md.	W. C. Tingle, Toledo, "
W. E. Schroeder, Deer Park, "	J. P. Goulden, " "
W. E. Shriner, New Windsor,	E. P. Comstocks, Warren, "
Md.	O. B. Vincent, Cincinnati, "
A. R. Fratie, Burlington, Ia.	E. J. Skinner, Corning, N. Y.
B. J. Nicord, Milwaukee, Wis.	E. E. Todd, Hornsillsville, "
O. H. Gray, Muscatine, "	J. A. Gleason, Bath Alum Spgs.,
Emma Bonnell, Racine, "	W. Va.
C. M. Haselton, Chicago, Ill.	J. McCoy, Longdale, Pa.
W. S. Manners, " "	R. Lipscomb, Rockeridge Bath
W. H. Lowther, " "	Pa.
D. S. Foote, " "	W. Cornahan, Sewells Pt., Va.
G. M. Eitmeier, " "	Mrs. St. John, Canton, Miss.
F. D. Moulton, " "	E. H. Dennett, Natchez, "
P. J. Graudin, " "	A. G. Russell, Vicksburg, "

H. S. Stevens, Marion, Md.	Frank Lee, Corinth, Miss.
Patterson, Bloomfield, N. J.	Leo Mainhart, Danville, Tenn.
J. R. Pendegrast, Hyde Park, "	J. E. Stiles, Dyer, "
Pa.	W. G. Davis, Franklin, "
R. O. Emerson, Philadelphia, "	C. Cozard, Dickson, "
Pa.	W. H. Smith, Tallahoma, "
D. J. Ragsdale, Larkinsville, "	Miss A. Fulton, Greenville,
Ala.	N. S.
W. W. Peoples, Clinton, Ala.	F. H. Taylor, Horton Landing,
A. V. Hill, Paint Lick, "	N. S.
Sam Love, Bon Aqua, Tenn.	E. P. Earle, Port Hastings, C.B

## TRANSFERS.

From.	To.
S. Jones, Pier 41,	Butter & Cheese Ex.
E. J. Hamilton, Butter & Cheese Ex.,	23d st. & 8th ave.
P. J. Flynn, Stewart's,	
S. H. Moore, Harlem,	Stewart's,
Lizzie A. Kircher, 23d st. & 8th ave.,	B'way & D y st.
Mary E. Redd, "	Gen. Relief Service,
P. L. Winckler, 520 Hudson st.,	407 Broadway.
W. W. Wright, 407 Broadway,	Brooklyn.

## IMPROVEMENT IN THE MARINER'S COMPASS.

Mr. George Hles, of Montreal, has invented an ingenious improvement of the ordinary compass, by which its variation from the true north, from whatever cause, can be immediately detected, and the amount of deviation accurately calculated. Mr. Hles's compass consists of a light bar of aluminium, nicely pivoted on the centre, having a number of minute magnets attached longitudinally. Of course this bar, when uninfluenced by other than natural causes, will point north and south. Above this bar is suspended another of similar construction, but with the small magnets arranged latitudinally. The effect is to cause the upper bar to point east and west, or, under normal conditions, at right angles with the lower. When the two bars are found varying from this right angle, local influences are indicated, and the amount of variation from the true north is determined by a comparison of the variation of the two bars. The invention has been patented in the United States, Canada, France and England, and has received high commendation from such experts as have examined it.

## BORN.

ATHEY—At Sparland, Ill., Sept. 6, 1875, a daughter to A. J. Athey, manager W. U. Tel. office.

COULTER—At New Castle, Pa., August 12, 1875, a daughter to A. M. Coulter, manager, W. U. Tel. office.

HOWDEN—At Louisiana, Mo., August 23, 1875, a son to Wm. J. Howden, manager, W. U. Tel. office.

SYKES—At Knoxville, Ill., September 5, 1875, a daughter to Larin R. Sykes, manager, W. U. Tel. office.

SPENCER—At Chester, Vt., September 8, 1875, a daughter to Henry P. Spencer, manager W. U. Tel. Office.

THOMPSON—At San Diego, Cal., Sept. 9, 1875, a daughter to J. W. Thompson, manager W. U. Tel. Office.

## MARRIED.

ANDERSON—WARNER.—At Bunker Hill, Ks., October 2d, 1875, W. B. Anderson, Agent and Operator, K. P. Ry., to Miss Kate Warner, of Dallastown, Pa.

ELDER—REITER.—At the residence of the bride's parents, Croton, Iowa, Sept. 8, 1875, by Rev. S. Marshall, H. M. Elder to Miss Susie Reiter, manager W. U. Tel. office at Croton.

HENRICI—IRONS.—At Indiana, Pa., Thursday, Sept. 16, 1875, by Rev. E. C. Ehrenfeld, Jacob F. Henrici, late of W. U. Tel. office, Pittsburgh, a., to Miss Viola Irons, of the W. U. Tel. office, McKeesport, Pa.

WEEKS—ASHLEY.—At Grace Church, Greenville, N. J., October 12th, 1875, by the Rev. James W. Coe, Harvey Kelsey Weeks of Danville, Vermont, to Miss Elsie Elizabeth Ashley, youngest daughter of J. N. Ashley, publisher of *The Telegraph*.

## DIED.

BREESE—At Binghamton, N. Y., Sept. 10, 1875, Morse, infant twin son of Herbert Y., and Grace A. Breese, aged 3 months and 18 days.

CASE—At Lafayette, N. Y., Wednesday, September 8, 1875, Emily J., wife of Homer Case, manager, W. U. Tel. office, aged 3 years.

COULEY—At Ralston, Pa., August 24, 1875, Mrs. Eliza Couley, aged 67 years and 20 days, mother of F. C. Couley, manager, W. U. Tel. office.

HELLINGS—At Key West, Fla., August 9, 1875, of yellow fever, Mary C., wife of manager Helling, of the I. O. T. Co.

EDMON—At Green Brier, Tenn., September 1, 1875, Etta, daughter of W. W. Edmon, operator, W. U. Tel. Co., aged 9 months and 29 days.



# NOTES OF A COURSE OF SEVEN LECTURES ON ELECTRICITY.

BY PROFESSOR TYNDALL, LL.D., F.R.S.

(Continued from page 291.)

[From the Telegraphic Journal.]

## NOTES OF LECTURE VI - March 11, 1875.

1. Lichtenberg devised a means of revealing the condition of an electrified surface by dusting it with powder. Red-lead, in passing through muslin, is positively electrified; flower of sulphur is negatively electrified. Whisking a fox's brush over a cake of resin, and drawing over the surface the knob of a Leyden jar, positively charged, the resin is rendered in part negative and in part positive. Dusting the mixed powder over the surface, the sulphur arranges itself over the positive places, and the red-lead over the negative places, a very beautiful figure being the result. The figures produced by the positive electricity are quite distinct in form from those produced by the negative.

2. This experiment of Lichtenberg's constituted the germ of Chladni's important acoustical researches. "Chladni's figures" were the direct offspring of "Lichtenberg's figures."

3. Cadogan Morgan, in 1785, sought to produce the electric spark in the interior of solid bodies. He inserted two wires into wood, and caused the spark to pass between them; the wood was illuminated with blood-red light, or with yellow light, according as the depth at which the spark was produced was greater or less. The spark produced within an ivory ball, an orange, an apple, or under the thumb, illuminates these bodies throughout. A lemon is especially suited to this experiment, flashing forth at every spark as a spheroid of very brilliant golden light. A row of eggs is also brilliantly illuminated throughout at the passage of every spark from a Leyden jar.

4. At an early period efforts were made to determine the direction in which the electricity moved. When a card, or a pack of cards, was perforated by the electric spark a burr was formed both at its place of entrance and its place of exit from the card. This indicated the operation of a power acting in two directions rather than in one direction.

5. We have already illustrated Franklin's cascade battery, in which the outer coating of each jar is connected with the inner coating of the next following jar. In the ordinary battery all the inner coatings are connected together. Such a battery acts as a single large jar of extraordinary dimensions.

6. Wires are warmed by a moderate electric discharge, by augmenting the charge they are caused to glow. The heat developed is proportional to the square of the quantity of electricity (measured by the unit-jar). With strengthened charge the metal is torn to pieces; fusion follows; and by still stronger charges the wires are reduced to metallic dust and vapor.

7. For such experiments the wire must be thin. Without resistance we can have no heat, and when the wire is thick we have little resistance. The mechanism of the discharge, as shown by the figures produced, is different in different wires. The figure produced by the dust of a deflagrated silver wire on white paper is especially beautiful.

8. When the discharge of a powerful battery is sent through a steel chain several feet in length, the lateral scattering of the particles of the chain and their combustion in the air constitute a brilliant and instructive experiment. Chain cables have been fused by being made the channels of a flash of lightning.

9. Retaining our conception of an electric fluid,

at this point we naturally add to it the conception of a current. It is the electric current which produces the effects just described. In many of our former experiments we had electricity at rest (static electricity); here we have electricity in motion (dynamic electricity).

10. Sending the current from a battery through a flat spiral (the primary) of copper wire, and placing within a little distance of it a second similar spiral (the secondary) with its ends connected, the passage of the current in the first spiral excites a current in the second, which is competent to deflagrate wires, and to produce all the other effects of the electrical discharge. Even when the spirals are some feet asunder, the shock produced by the secondary current is still manifest.

11. The current from the secondary spiral may be carried round a third; and this third spiral may be allowed to act upon a fourth, exactly as the primary did upon the secondary. A tertiary current is thus evoked by the secondary in the fourth spiral.

12. Carrying this tertiary current round a fifth spiral, and causing it to act inductively upon a sixth, we obtain in the latter a current of the fourth order. In this way we generate a long progeny of currents, all of them having the current first sent from the battery for a common progenitor. To Prof. Henry, of the United States, and to Prof. Riess, of Berlin, we are indebted for the investigation of the laws of these currents. These researches, however, were subsequent to—and were indeed suggested by—experiments of a similar character previously made by Faraday with voltaic electricity.

13. Franklin made an exhaustive comparison of the effects of electricity and those of lightning. The lightning flash is of the same shape as the elongated electric spark; like electricity, lightning strikes pointed objects in preference to others; lightning pursues the path of least resistance,—it burns, dissolves metals, rends bodies asunder, and strikes men blind. Franklin imitated all these effects, striking a pigeon blind, and killing a hen and turkey by the electrical discharge.

14. Having completely satisfied his mind by this comparison of the identity of both agents, he proposed to draw electricity from the clouds by a pointed rod erected on a high tower. But before the tower could be built he succeeded in his object by means of a kite with a pointed wire attached to it. The electricity descended by a hempen string to a key at the end, the key being separated from the observer by a silken string held in the hand; he thus obtained sparks, and charged a Leyden phial with atmospheric electricity.

15. But, spurred by Franklin's researches, the electrical character of lightning had been previously proved in France. A translation of his letter fell into the hands of the naturalist Buffon, who requested his friend D'Alibard to revise the translation. D'Alibard was thus induced to erect an iron rod 40 feet long, supported by silk strings, and ending in a sentry-box. It was watched by an old dragon named Coiffier, who, on the 10th of May, 1752, heard a clap of thunder, and immediately afterwards drew sparks from the end of the iron rod.

16. The danger of experiments with metal rods was soon illustrated. Richmann, of St. Petersburg, had a rod raised 3 or 4 feet above the tiles of his house. It was connected by a chain with another rod in his room; the latter resting in a glass vessel, and being therefore insulated from the earth. On the 6th of August, 1753, a thunder-cloud discharged itself against the external rod; the electricity passed downwards along the chain; on reaching the rod below it darted from it to Richmann's head, which was about a foot distant, and killed him on the spot.

Had a perfect communication existed between the lower rod and the earth, the lightning in this case would have expended itself harmlessly.

17. In 1749 Franklin proposed lightning conductors. He repeated his recommendation in 1753. He was opposed on two grounds. The Abbe Nollet and those who thought with him considered it as impious to ward off heaven's lightning as for a child to ward off the chastening rod of its father. Others thought that the conductors would "invite" the lightning to break upon them. A discussion was also long carried on as to whether the conductors should be blunt or pointed. Wilson supported the first view, against Franklin, Cavendish, and Watson. He so influenced George III. that the pointed conductors on Buckingham House were changed for others ending in balls. Experience of the most varied kind has justified the employment of pointed conductors. In 1769 St. Paul's Cathedral was first protected.

18. The most decisive evidence in favor of conductors was obtained from ships; and it was required, to overcome the obstinate prejudice of seamen. Case after case occurred in which ships unprotected by conductors were singled out from protected ships, and shattered or destroyed by lightning. The conductors were at first movable, being hoisted on the approach of a thunder storm; but these were finally abandoned for the fixed lightning conductors devised by the late Sir Snow Harris. The saving of property and of life by this obvious outgrowth of electrical research is incalculable.

## EXPERIMENTS IN LECTURE VI.

(1.) Note 1 was illustrated with the cake of an electrophorus. The negative sulphur formed branching and stellar shapes of great beauty on the positively electrified portion of the cake.

(2.) To connect them with Lichtenberg's figures an example of Chladni's figures was shown. Fine sand being strewn upon a brass plate a foot square, the plate was caused to emit a musical sound; the sand immediately retreated from the vibrating portions of the plate and arranged itself sharply as the system of "nodal lines," along the places of no vibration.

(3.) Two thick wires were pushed into an apple from opposite points, and brought within about  $\frac{1}{2}$  an inch of each other within the apple. On causing the spark of a Leyden jar to leap over this interval the apple glowed. The glow of a lemon under the same circumstances was particularly brilliant. A row of eggs in a tall glass jar, with its metal bottom connected with the earth, shone brightly when the discharge passed through them.

(4.) The arrangement, charging, and discharging of the ordinary electric battery were illustrated, as also the use of the unit-jar.

(5.) Seven cards were placed between the knobs of the universal discharger. After the discharge had passed through them, the central card was found without any burr. Right and left from this the burr was in opposite directions, being most pronounced in the case of the two external cards.

(6.) Wires of platinum and of silver were deflagrated, leaving the impress of the metallic dust on the white paper.

(7.) The lateral scattering of the metal was further illustrated by sending the charge through a steel chain. The chain, during a passage of the electricity, bristled with lateral spikes of light.

(8.) Note 10 was illustrated by deflagrating 6 inches of silver wire by the secondary discharge. When the spirals were far apart, gun-cotton—placed between the knobs of the universal discharger—was ignited by the secondary spark.

### EXPLOSIONS IN GUNPOWDER MILLS BY ELECTRICITY.

A correspondent remarked, some time since, that the mysterious explosions of some powder mills may probably be due to an electric spark given off by persons dressed in woollen clothing, who, when the air is dry, may (by friction of their clothing or feet) produce from their finger ends a spark of electricity sufficient to ignite a gas jet. He submitted the question whether it would not be possible that men at work in powder mills may create so much electricity in their bodies that, when their hands come in contact with metallic conductors, it may be, if not sufficient to ignite powder, enough to ignite some inflammable gas generated from the chemicals.

This letter has drawn the attention of the *London Chemical Review*, which states that in England they have often seen in American journals the statement that an electric spark, sufficient to ignite gas, may be given off by the human hand; but the editor says he never heard of such cases on his side of the water. We know that the air in England and all the countries of Western Europe is very damp, owing to the prevailing west winds and the absence of extensive areas of dry land, blowing over which the wind would become very dry, as are west winds, coming over our prairies.

It is asked what inflammable gas may be generated in the manufacture of gunpowder? To this, it may be answered that, in the manufacture of fulminates for percussion caps, inflammable vapors, as nitrous ether, etc., are given off, while the dust of gunpowder and even of charcoal, when floating in the air in a proper quantity, may form an explosive mixture. Even the dust from the mineral grahamite, which in its character is very similar to gunpowder charcoal, has repeatedly exploded in the mines in Western Virginia, when mixed with air in the right quantity. It is well known among electricians that a weak electric spark will more easily explode gunpowder than a strong, intense spark; the latter will scatter a heap of gunpowder without igniting it, but, when the spark is weakened by substituting for a part of the conducting metal a less conducting material, such as water or moistened thread, then ignition will readily take place.

We acknowledge that we have no positive evidence that powder mills have actually been exploded by electricity; but the possibility of such a cause was only suggested in our paper, and it must be admitted that this suggestion is not unworthy of serious attention.—*Scientific American*.

### THE MAGNETIZATION OF GAS SPECTRA.

Some very curious experiments have recently been laid before the French Academy of Sciences by M. Chautard, relative to the influence of a powerful magnet upon the spectra of gases contained in the Geissler tubes and illuminated by means of the electric current. In all simple bodies of the chlorine family, and in the gaseous or volatile compounds derived therefrom which thus far have been examined, the action of the magnet is immediate, and manifests itself, not merely by a change of color in the tube, but by an increased brilliancy of the spectral lines, which become doubled. The bodies thus far submitted to investigation, besides chlorine, which behave similarly, includes bromine, iodine, the chloride-bromide and fluoride of stibium, the fluoride of boron, hydrochloric acid, chloride of antimony, and of bismuth, bichloride of mercury, and the protochloride and bichloride of tin.

The lights of sulphur and selenium become extinguished the instant the magnet is excited, and the same is the case with that of the tubes containing

chlorine, bromine, and iodine, when the tension of the coil is suitable. The feeble brilliancy of the oxygen illumination is not sensibly modified, nor is that of carbon compounds, such as carbonic acid, carbonic oxide, etc. The fine bands of the nitrogen spectrum are not changed, except in the red and yellow portion. These colors become almost completely extinguished, or at least are replaced by a flat uniform tint, in which all traces of lines disappear. The lines in the more refrangible region remain intact.

The hydrogen lines keep sensibly their normal appearance, but by employing a sufficiently powerful magnet, at the moment of excitation a very brilliant line appears, which is due to sodium, doubtless obtained from the surrounding glass. This line vanishes as if by magic when the current is interrupted, to reappear again, however, for some time, as often as the electric flow is established. Eventually it loses intensity, and it becomes necessary to allow the tube several minutes of repose before the line can be caused to appear. It shows itself also in nitrogen tubes, and in those containing carbonic and hydrochloric acid.

The protochloride of tin, crystallized and dry, but bihydrated, offers remarkable phenomena of dissociation under the magnetic influence. Normally the spectrum is pale, and shows a few of the green chlorine lines; but as soon as the magnet is excited, two characteristic bands of hydrogen, the red and blue, appear, which remain as long as the magnetization exists, and return with the same indefinitely. M. Chautard attributes this to the momentary separation of the elements of the water of the salt, due to the considerable resistance opposed to the passage of the induced current during the magnetization.

M. Chautard's investigation is still in progress, and doubtless further novel and interesting results remain to be adduced. The phenomena noted are remarkable, and will attract the attention of chemists and physicists generally.

### MAGNETIC RAILWAY LOCOMOTIVES.

In an arrangement lately devised by M. Burgin, the entire axle, with its wheels, is made into one electro-magnet. The wire is wound with increasing thickness from the middle towards the wheels, in the case of external cranks, but uniformly in the case of internal. With coupled wheels the wire is so arranged that there is an alternation of poles, the piece of rails between two poles forming the armature. A locomotive model (without engine or boiler), having three pair of wheels and internal cranks, was placed on a line with 30 per cent. incline. Five Bunsen elements supplied the force, and a weight of 25 lbs., with cord, passed round the axles. The machine weighed 18 lbs., and, with no current flowing, the wheels merely slid on the rails in position; but when the circuit was closed, the model ran up the incline. When the brake was applied (and weight detached), the model could be held on the steep incline if the current were passing; but if not, the wheels began to slide and the locomotive went downward with increasing pace; but this descent was promptly stopped when the current was made to flow again.

### PREPARATION OF EBONITE

The use of ebonite, one of the newer preparations of India rubber is constantly increasing, on account of its better applicability to many purposes in the arts than its near ally, vulcanite. The two substances are quite similar, being composed of India rubber and sulphur, with some preparation of gutta percha, shellac, asphalt, graphite, etc.; although these latter are not essential. In vulcanite the amount of sulphur

does not exceed 20 to 30 per cent, whereas in ebonite the percentage of sulphur may reach as high as 60. An increased temperature is also required for this preparation. The approved formula consists in mixing together 100 parts of rubber, 45 of sulphur and 10 of gutta percha, with sufficient heat to facilitate the combination. In manufacture, a sufficient quantity of this mixture is placed in a mould of a desired shape, and of such material as will not be affected by the sulphur contained in the mass. It is then exposed to heat of about 315°, and a pressure of about 12 pounds to the square inch, for two hours. This is done most readily by placing the mould in a steam pan, where the requisite pressure and temperature can easily be kept up. When cold the ebonite is removed from the mould, finished and polished in the usual manner.

### THE DIAGOMETER.

Prof. Palmieri has discovered a new instrument which he calls the "diagometer," and which is constructed for the rapid examination of oils and textures by means of electricity. What the apparatus will do Prof. Palmieri details thus: 1. It will show the quality of olive oil. 2. It will distinguish olive oil from seed oil. 3. It will indicate whether olive oil, although of the best appearance, has been mixed with seed oil. 4. It will show the quality of seed oils. 5. Finally, it will indicate the presence of cotton in silken or woollen textures. The professor has been complimented for this invention by the Chamber of Arts and Commerce at Naples, who have published a full description of the apparatus, with instructions for use.—From *Nature*.

**MAGNETS FORMED WITH COMPRESSED POWDERS.**—M. J. Jamin.—De Haldat published in 1836, in the *Memoires de l'Academie de Stanislas*, an interesting observation. He placed iron filings in a brass tube with screw stoppers; magnetized it by ordinary means, and found that it had acquired and preserved at its extremities two contrary poles. The polarity did not augment sensibly when the stoppers were tightened; it only diminished slowly when increasing quantities of sand were mixed with the filings. In all cases the polarity was feeble, and disappeared on shaking the tube. M. Jamin has repeated the observation, compressing the filings strongly by means of a small hydraulic press. The polarity increases with the pressure. Filings were prepared under the author's eyes from very soft iron, perfectly reduced, and free from coercitive force. The result did not diminish. Here, therefore, is a metal which has no coercitive force when it is continuous, but which acquires a force as considerable as that of steel if reduced to discontinuous fragments, and aggregated by pressure. Is it not to this discontinuity that the force observed must be ascribed, and is it not this same cause which explains the coercitive force of steel? If the filings before pressure are mixed with matters which render the mass more homogeneous, the same degree of polarity is no longer produced. For instance, on making a paste of chloride of iron and iron filings, and pressing it, we obtain after some days a sub-chloride of iron of continuous appearance; which may be filed and polished like pure iron, but which scarcely becomes magnetic.

The blue flame from a coal fire has a temperature of 5,500 degrees Fahrenheit, the flames of hydrogen and of oxyhydrogen 9,500 degrees. The temperature of the electric spark is unknown, but is supposed to be about 22,000 degrees Fahrenheit.

at the outer bar by an agent of the company, with instructions to proceed to Port Royal, where she remained until a few days ago.

The Punta Rasa cable, which had been interrupted several times during the summer, involving a considerable loss of revenue, and extra expenses for temporary repairs, gave out entirely a few weeks ago, since when communication has been maintained by steamer. While this is being written, information has been received that the "Morse" has successfully laid the new cable, which is working perfectly, and that telegraphic communication with Key West and Havana has been restored.

A fault has been discovered in the cable of 1869 between Key West and Havana, and although the use of this cable is not required for the present volume of traffic, the new and better cable of 1873 being capable of passing double the present number of messages, the "Morse" will proceed at once to discover and repair the fault. When this has been done, the other cable between Key West and Punta Rasa will be repaired, and when this is done the company will then have two lines of cable from Punta Rasa to Havana.

Although the development of telegraphic business with Cuba has been greatly retarded by the condition of affairs on that island, the extension of the West India and Panama Company's cable system to a connection with the cables to Brazil, and the recent establishment of cables along the coast of Chili and Peru is bringing a handsome increase of traffic to the I. O. T. Co.'s lines, and the prospects for the future are most encouraging.

#### MONEY TRANSFER SERVICE.

The number of telegraphic money orders received during the year was 34,853. The amount transferred thereby was \$1,963,247.06, and the revenue accruing to the company was \$87,219.40, being an increase over the revenue received during the preceding year of \$6,889.54, or about 8½ per cent.

The increase in the number of transfers was about 11 per cent., but the average amount transferred in each case was but \$56.33 against \$61.83 during the preceding year. For the first six months of the year, the increase in revenue was only 6 per cent.; but during the six months ended June 30, the increase was about 12 per cent., and there are indications of a much larger growth during the present fiscal year, the returns for July showing an increase of 13 per cent., and for August, of 16 per cent. over the corresponding period of the preceding year. The receipt at a large number of offices of small sums aggregating about \$2,000,000, and the payment of the same at other offices has been accomplished without the loss of a dollar.

#### GENERAL REVIEW.

The growth of the company's property and business during the nine years which have passed since the consolidation with the other principal telegraph lines, is shown by the following statistics:

From 1867 to 1875, the extent of line has increased from 46,270 to 72,833 miles, and the wires from 85,290 to 179,294 miles, being an increase of 57 per cent. of line, and 110 per cent. of wire. The number of offices and stations has increased from 2,565 to 6,565, equal to 156 per cent. During the same time, the number of messages transmitted has increased 192 per cent., the rate of tolls has decreased 51 per cent., and the gross receipts have increased 46 per cent. The average cost per message, during the same time, has been reduced from 67 to 37 cents, or about 45 per cent. The increase of 192 per cent.

in the number of messages transmitted annually, while the mileage of wire has increased but 110 per cent., is explained by the fact that the number of messages transmitted per mile of wire, has been increased 41 per cent.

The ability to make so large an increase in the carrying capacity of the wires, is due in part to improvement in their conductivity and insulation, and in part to the introduction of the duplex and quadruplex apparatus, by means of which one wire is made to do the ordinary work of two, three, or four wires. By means of this apparatus, during the past year, the company has had the use of more than 30,000 miles of what may be called "phantom wire," which has cost nothing to provide, repair, and maintain, except the cost of the new apparatus, which is but little more expensive than that in general use, and is adapted to all the ordinary requirements.

#### THE TARIFF OF MESSAGE RATES.

No general change has been made in message rates during the year. In February last, pursuant to previous public announcement, the rates on the lines of the Atlantic and Pacific Telegraph Company between Boston, Albany and Washington, and intermediate stations, were reduced to a uniform rate of twenty-five cents. A corresponding reduction was made by this company, which took effect on the same day. The reduced rates, after having been in operation about six months, were abandoned by an arrangement between the companies, and the former rates restored.

The fact that at the end of nine years, during which time the number of messages has increased 192 per cent., and the average cost per message has been reduced 45 per cent., it now costs this company an average of 37 cents per message for more than 17,000,000 messages, must be accepted as conclusive proof that a company possessing small facilities compared with ours cannot realize profit from transmitting messages at the rate of twenty-five cents each. It undoubtedly proves more than this—in view of the further fact, that the cost to this company during the past year for operators and messengers' wages, was an average of twenty-one cents per message, and the repair and maintenance of lines cost five cents per message and that is, that the Western Union Company derives no profit from the transmission of messages at the rate of twenty-five cents, even within the short distance of twenty-five miles, which is the limit of that rate.

Previous to 1869 but little effort had been made to introduce order and system into the rates charged for messages. In October of that year, a system was inaugurated for the computation of rates by air-line distances. But these rates were different for like distances in different sections of the country.

In May, 1871, all charges above \$5.00 were discontinued, and that sum was made the maximum rate for the greatest distances. Although some of the rates previously in force were as high as \$10 per message, and the average rate between the Atlantic and Pacific coasts was over \$6.00, the reduction of the maximum rate to \$5.00 was not followed by any apparent loss of revenue. On the contrary, it was evident that the increase in the number of messages more than made up for the reduction in rates. But whether this increase resulted more from the reduction than from the natural tendency of the business to increase cannot be positively stated. Subsequent investigation developed the fact that about 90 per cent. of the revenue from messages was derived from rates not exceeding \$2.50 per message, and in February, 1873, the maximum rate was reduced from \$5.00 to \$2.50. On July 1, 1873, the rates were still

further reduced, and the tariff system simplified by making the rate uniform for like distances in all sections of the country, and by reducing the number of rates to ten (25, 30, 40, 50, 75, 1.00, 1.25, 1.50, 2.00, 2.50).

The reductions in message rates made by this company during the past nine years have been greater in the aggregate than have ever been made upon the entire traffic of any other telegraph system, private or governmental, in the same period of time.

When, nearly six years ago, the British Government acquired possession of the telegraphs, a uniform rate of one shilling sterling was established. This was equivalent to an average reduction of about thirty-three per cent. of the rate previously in force, and the present rate is not materially less for like average distances than the rate now charged by this company.

Under the energetic management of Frank Ives Scudamore, Esq., C. B., extensive additions were made to the British telegraph lines, the most approved apparatus was introduced, and every department of the service was increased in efficiency. The result has been an enormous increase in the number of messages and a corresponding increase of revenue. But the expenses have increased in a still greater ratio, so that at the end of the last fiscal year, March 31, 1875, the deficiency in the sum required for the expenses of the year, including interest at the rate of three per cent. per annum upon the capital, was more than one million dollars.

The following table is taken from the report of a special commission appointed by the British Treasury to investigate the Postal Telegraph Accounts, dated July 17, 1875.

Year ended—	Number of Messages.	Surplus of Income over Working Expenses.
		£ s. d.
March 31, 1871.....	9,650,177	303,456 13 5
" 1872.....	12,473,706	159,834 12 8½
" 1873.....	15,575,780	103,130 2 8½
" 1874.....	17,821,530	90,033 6 11½
" 1875.....	19,253,120	36,725 0 0

As much stress has been laid upon the fact that the English rate is for a message of twenty words, instead of ten, as in this country (date, address, and signature are sent free in both countries), it is proper to take notice of it in this connection. It appears, however, from the official report, from which the above exhibit is taken, that, although the British public have the privilege of sending twenty words, this privilege is only partially availed of, for, in an aggregate of more than eighteen millions of messages per annum, the average number of words per message was but seventeen. The inference is plain—that if the inducement to send so many words without extra charge had not been presented to every customer by the twenty vacant spaces on the blank form on which every message was required to be written, the average number of words per message sent would have fallen below seventeen.

The result of governmental operation of the telegraph in England does not differ essentially in results from governmental management of other kinds of business. As compared with private, governmental management of telegraphs, railways, canals, ship building, manufacturing and other kinds of business, is invariably more expensive and rarely more satisfactory in any respect.

#### THE ATLANTIC CABLES.

During the year covered by this report, the United States Direct Cable Company has continued its efforts to establish telegraphic communication by



an independent line between Great Britain and the United States, and although these efforts were not successful until after the close of the fiscal year, the completion of the new line had been accomplished before the preparation of this report commenced.

In May last, the Anglo-American Telegraph Company, owning three cables between Valencia, Ireland, and Sidney, N. S., via Newfoundland, and one between Falmouth, England, via Brest, France, and the Island of St. Pierre and Duxbury, Mass., reduced the rate for trans-Atlantic messages from four shillings to two shillings sterling per word. When the United States Direct Company's cable was opened for business in September last, the rate was fixed by both companies at one shilling (twenty-five cents coin) per word.

During the period of about four months, while the two-shilling rate was in force, the number of cable messages increased about thirty-five per cent. over the number transmitted during the corresponding period of the preceding year. The shilling rate had been in operation less than a month when the new cable failed; thereupon the Anglo-American Company restored the four-shilling rate, in force prior to the reduction which it had made in May last.

Although, by the terms of a contract entered into five years ago, the cables of the Anglo-American Company connect exclusively with the lines of the Western Union Company, the latter has no voice in deciding what the rates for transatlantic messages shall be. This company receives a portion of the tolls on cable messages between New York and European stations, which tolls are fixed by the Anglo-American Company. As the Western Union Company has been severely censured on account of the advance in cable rates, justice seems to require this statement of the facts. This company has no more power to fix the rate for a cable message to Europe than we have to fix the rate for passage by steamer across the Atlantic. It is proper to add, however, that, on receipt of notice of the intention to advance the rate from one shilling to four shillings per word, an earnest request was sent to the Manager of the Anglo Company in London to have their action reconsidered, and the rate fixed at two shillings a word. Our request was declined on the ground that the revenue at the reduced rates had proved entirely inadequate to insure the permanent maintenance of the cables and the expense of operating them, and afford the proprietors any return upon their investment.

#### IMPROVED APPARATUS.

It has been known for years all over the world that signals could be transmitted through a wire much more rapidly by machinery than by hand, but the attempt to utilize this fact by the substitution of machinery in the transmission of messages, for the key in the hand of the operator, has never been successful, for the reason that the process is not economical either in respect to time or labor. A single message can be transmitted and copied in less time by the hand (Morse) process than by any other, (except by the printing telegraph, which, for well understood reasons, is not adapted to general use). What the public require is that each message shall have immediate dispatch, and they have no other interest in knowing that, by waiting awhile, the mere act of transmitting the signals which represent their messages can be performed by a beautiful process at an extraordinary rate of speed, except to know what to avoid.

The transmission and copying of a message at the other end of the circuit by the hand (Morse) process,

are simultaneous acts, both of which can be accomplished in as short time as a message can be prepared for transmission by the so-called automatic process, and both of which can be performed in less time than a message can be translated, after it has been transmitted by the automatic process. So that, when the admirers of this mode have proved conclusively that the act of transmission by their process takes no time at all, they prove too much, because even then the time during which a message must inevitably remain in their hands, is twice as long as is necessary with the other process. We have therefore declined to introduce processes, whatever their advantages otherwise might be, the substitution of which for those we now use would inevitably increase the time required for the delivery of a message at its destination.

The duplex and quadruplex apparatus, of which previous mention has been made herein, are fully realizing the expectations formed a year ago and set forth in my last annual report.

As the assertion has been frequently published that this company does not control the patents for the quadruplex apparatus, it is proper to state here that the process known by that name was developed by Thomas A. Edison, assisted by George B. Prescott, the electrician of the company, while Edison was fulfilling an agreement made with me to perfect improvements upon the Stearn's duplex apparatus owned by this company; and that subsequently a written contract for the sale of the quadruplex patents to this company was executed by both inventors, and the sum of ten thousand dollars paid thereon.

It is true, that in face of these facts, one of the parties deliberately undertook to deprive the company of that which he had sold to it, by giving subsequently a pretended title to another party; but the right of this company to own and control exclusively that which it has purchased in good faith and partly paid for, will not, we think, be seriously disputed to the extent of a legal trial.

On account of the conflicting claims which have been set up, no patents covering the quadruplex apparatus have yet been issued in this country; but it is believed that such issue must take place during the coming season, and the control by this company of the quadruplex method be thereby made complete. Careful attention is constantly being given to the subject of improvement in telegraphic modes and apparatus, and neither pains nor expense will be spared to secure for the company the use of whatever will tend to promote the efficiency of the service in the future.

Respectfully submitted,  
WILLIAM ORTON,  
President.

Few bodies are more easily electrified than collodion. With the least friction by the hand, the membrane adheres to the fingers. If a collodion sheet be fixed, like a flag, to a glass tube, and waved in dry and hot air, it is electrified. Other uses of collodion sheets, here mentioned, are in experiments on polarization of light, on colors of thin films, on diathermaney, on vibrations in acoustics. M. Gripon prepares these sheets by dissolving 1.5 to 1.7 grains gun cotton in a mixture of 50 grains alcohol and 50 grains ether. The collodion is poured on a glass plate after the latter has been breathed upon so as to receive a coating of moisture. When—after some hours—the collodion is dry, the plate is put in water; and a sheet of paper having been applied and attached to the collodion by the edges, the film is drawn off with the paper.

#### EXPERIMENTS UPON THE RAPIDITY OF MAGNETIZATION AND DEMAGNETIZATION OF IRON AND STEEL.

By M. DEPREZ.

In prosecuting my investigation with electro-magnets and their employment in registering very rapid phenomena, I was led to inquire what was the influence of the nature of the iron in the electro-magnet upon the processes of magnetization and demagnetization. With this view, I employed a registering apparatus in which the pieces of iron forming the electro-magnet were movable, all the other parts, such as the coils, armature, pointer, etc., remaining the same. To measure the duration of the processes of magnetization and demagnetization, I employed the method described in my first communication upon electric chronographs.

The metallic portion of the electro-magnet, which I inserted successively in the magnetizing coils, was formed by two cores of 2 millimeters in diameter and 13 millimeters in length. The coils, through which the current was passed, consisted of 14 meters of wire, one-fifth of a millimeter in diameter. The battery used was one Bunsen cell as modified by M. Dulaurier. The different kinds of iron tried were the ordinary iron of commerce, the specially soft telegraphic iron, malleable cast iron, gray cast iron, and, lastly, cast steel drawn and tempered.

The results obtained were entirely unexpected, for the soft iron, the ordinary iron, the malleable cast iron, and even the tempered steel gave, very nearly, the same results for the times of magnetization and demagnetization, that is to say, duration of demagnetization 0.00025; duration of magnetization (approximately), 0.00150 of a second.

The final result is, that with my present registering apparatus, which will shortly be described, perfectly clear signals can be obtained, succeeding each other at intervals of one-three-hundred-and-fiftieth of a second, no matter what kind of iron is used for the electro-magnets, and at intervals of one-five-hundredth of a second when gray cast iron is employed. It should be carefully observed that I do not here speak of signals following each other in regular succession at intervals of a three-hundredth-and-fiftieth or five-hundredth of a second, so as to form an equidistant series. In the latter case a number of signals much greater than 350 or 500 per second could be transmitted.

I am inclined to believe that the superiority of cast iron is due to its molecular structure, and not to the amount of carbon contained in it. It is therefore my intention to try the soft iron cast and not forged, which will, I believe, give results surpassing in rapidity all that I have hitherto obtained. I propose, besides, in a short time to treat, in another communication, of the details of my experiments, and of the application of my registering apparatus to electric chronographs specially arranged in connection with artillery.

It should be particularly noted that the times indicated above are exclusive of the time occupied by the pointer in traversing its course. This time has to be added to that occupied by the magnetization and demagnetization to arrive at the three-hundred-and-fiftieth or five-hundredth of a second for the total duration of a signal comprising the demagnetization, the time during which the pointer is falling, the magnetization, and lastly, the return of the pointer to its original position. These numbers have reference, besides, to the case where only a single battery element is used, the number of signals per second transmitted increases with the intensity of the current.—*Association Scientifique.*

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Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, OCTOBER 15, 1875.

## WESTERN UNION TELEGRAPH COMPANY.

### ELECTION OF DIRECTORS.

At the Annual Meeting of the Stockholders of the Western Union Telegraph Company, held at the office of the Company, Broadway and Dey street, New York, October 13th, 1875, the following named gentlemen were elected Directors and Inspectors of Election for the ensuing year:

#### Directors.

WILLIAM ORTON,	C. LIVINGSTON,
JAMES H. BANKER,	JAMES MILLIKEN,
ALONZO B. CORNELL,	LEVI P. MORTON,
HARRISON DURKEE,	JOHN DUFF,
NORVIN GREEN,	O. H. PALMER,
JOSEPH HARKER,	GEORGE M. PULLMAN,
EDWIN D. MORGAN,	E. S. SANFORD,
AUGUSTUS SCHELL,	JOHN STEWARD,
W. K. THORN,	MOSES TAYLOR,
C. VANDERBILT,	DANIEL TORRANCE,
FRANK WORE,	W. H. VANDERBILT,
CHESTER W. CHAPIN,	W. R. VERMILYE,
WILSON G. HUNT,	E. B. WESLEY,
DAVID JONES,	D. O. MILLS,
E. D. WORCESTER.	

#### Inspectors of Election.

GEORGE B. PRESCOTT,	LEONARD COX,
WILLIAM ARNOUX.	

At a meeting of the Board of Directors, held at the Executive Office, Thursday, October 14th, the following officers were elected:

WILLIAM ORTON, *President.*

ALONZO B. CORNELL,

NORVIN GREEN,

AUGUSTUS SCHELL,

HARRISON DURKEE,

*Vice-Presidents.*

#### Executive Committee.

WILLIAM ORTON,	JOSEPH HARKER,
JAMES H. BANKER,	EDWIN D. MORGAN,
ALONZO B. CORNELL,	AUGUSTUS SCHELL,
HARRISON DURKEE,	W. K. THORN,
NORVIN GREEN,	C. VANDERBILT,
FRANK WORE.	

Executive Order No. 163, relating to Government messages, will be found on page 310. It modifies Executive Order No. 158 and revokes Orders Nos. 125 and 144.

## TELEGRAPHIC PROGRESS IN 1874-5.

The sum of the progress of the electric telegraph in the United States is comprised in the history of the Western Union Telegraph Company, and this is fully illustrated and set forth yearly in the reports of the President of that Company to the stockholders. In the report for 1874-5, which we publish in another part of this issue, Mr. Orton presents a very flattering exhibit of the financial condition of the Company, upon which there is no occasion for comment except it be as a subject for congratulation. But to its character as a record of the progress made during the twelve months embraced in the report we desire to call attention.

We find that on June 30th the Company were operating 6,565 offices, with 179,294 miles of wire upon 72,833 miles of poles. The comparatively small increase in mileage over previous years, however, is only an apparent one. The actual increase has been not less than 30,000 miles of wire, evoked, as it were, out of nothing. The improved apparatus introduced, in doubling and quadrupling the carrying capacity of a wire, has virtually materialized a "phantom," as Mr. Orton aptly terms it, and which materialization is utilized without any expense for maintenance. The benefits of telegraphic communication have been conveyed to 377 places which heretofore had been without this convenience. This number is a little below the average of the previous eight years, but it is to be accounted for in the almost complete cessation in the construction of railways and the consequent decrease in the formation of new towns and settlements. The number of messages transmitted, shows an increase of 824,454 over the preceding year; the total number being 17,153,710. The number of telegraphic money transfers, a service of great value to the public, and which is peculiar to the Western Union Company, has largely increased. About \$2,000,000 was received and paid out at the various offices.

But it is in the question of rates charged for transmission that the public have the greatest concern. The report shows that even with a reduction in expenses to the extent of over \$420,000, as compared with the previous year, the actual cost of handling a message between points distant from one to twenty-five miles, is not less than twenty-six cents. This important fact alone proves the impossibility of successfully establishing a postal system at a uniform rate of twenty-five cents to all points of the country, which was the rate fixed upon by the advocates and promoters of those pernicious schemes, and upon which was based the expectation of popular support.

Since 1867, the yearly average increase in the number of messages transmitted has been twenty-four per cent., and during the same period the tolls have been reduced fifty-one per cent. This reduction is greater in the aggregate than has ever been made upon the entire traffic of any other telegraph system in the same period of time.

Altogether the telegraphic interests of the country could hardly be in a better condition. Invention is

encouraged, and improvements are welcomed. The eminently wise and sagacious policy pursued by the leading Company affords entire satisfaction to the public. These facts and the certainty of their continuance presents an augury of the future promising in the highest degree.

## THE NEW FLORIDA CABLE.

The cable steamer *Professor Morse* successfully completed the laying of the new cable of the International Ocean Telegraph Company between Key West and Punta Rassa on Monday last. Mr. Theophilus Smith, assistant to Sir Samuel Canning, the engineer employed to superintend the construction and laying of the cable, had charge of the work, being assisted by Mr. Hellings, manager of the Key West office, and by Mr. Wm. Mackintosh, foreman of repairs in the New York District.

The insulation of the new cable is excellent, tests showing a resistance of 360 megohms per knot.

## NEW FORM OF FRANK.

A new form of Frank has been prepared for the use of United States Government officials when absent from their places of residence, travelling upon official business, which is intended to obviate the difficulty which they sometimes experience in being identified as persons entitled to send messages without paying for them at the time of presentation, in cash.

These Franks are issued at the request of heads of Government Departments and Bureaus, by whom they are required to be countersigned, before becoming valid.

The attention of all parties interested is called to the notice which appears on the backs of these Franks, in which directions are given for the disposition of messages transmitted under their authority.

## CABLE RECEIPTS.

During the last week in August the average daily receipts of the Anglo-American Company, at the fifty cent. rate, were \$6,165. The receipts, at twenty-five cents per word, for the seven days in September when competition existed with the Direct Cable Company, averaged \$3,770. For the last six days, during which period there was no competition, the tariff continuing to be twenty-five cents, the average receipts were \$4,890. On October 4th the one dollar rate went into operation. The average daily receipts for the following week amounted to \$11,170.

The figures show an increase in the traffic of 35 per cent. at the reduction from one dollar to fifty cents, and a further increase of 14 per cent. at the reduction to twenty-five cents.

The Western Union Company is paying the principal and accrued interest on its bonds, maturing November 1st, 1875, upon delivery of the bonds at the office of the Treasurer.

## THE POST OFFICE TELEGRAPHS.

*From the Edinburgh Scotsman.*

The report of the committee appointed by the Treasury "to investigate the causes of the increased cost of the telegraph service since the acquisition of the telegraphs by the State" has been issued. The points to which the attention of the committee were directed specially were (1), the causes of the very serious discrepancies between the estimates of telegraph expenditure, year after year, and the actual outlay; (2), the general expenses of the service as compared with those of the telegraph companies, (a) as to the conduct of the business by the staff employed for the transmission of messages, (b) as to the cost of maintenance and extension; and (3), the extent to which officers' services are maintained which are not required by public convenience, and are not paying expenses.

As to the first point, the committee found that the net deficit of £34,447 in the estimates for the first 14 months of the Government working of the telegraphs was largely due to a mistake as to the reduction which the Post Office authorities hoped to effect by the amalgamation of the different telegraph companies into one great establishment. According to the data on which the first estimate was framed, it was expected that the Post Office would employ only 1,528 clerks, etc., and 1,283 messengers, whereas six months after the date of the transfer, there were employed no less than 4,913 clerks, etc., and 3,116 messengers, so that the staff of the telegraph branch as compared with that of the companies were more than doubled. This fact alone easily accounts for a great part of the excess of expenditure. The committee are of opinion that, considering the difficulties which lay in the way of framing the estimates for the first fourteen months before any experience had been obtained of the working of the telegraph system under Government control, it was hardly to be expected that a more correct estimate could have been presented. In the accounts for the year 1871-2, the original estimate of expenditure by the Post Office was £420,000, while the actual expenditure amounted to £591,775, 18s. 0½d. Here, again, the committee have been unable to obtain any details of the heads under which the expenditure exceeded the estimate. They are informed, however, that the charge for stationery was in this, as in every succeeding year, very much under-estimated. In the year 1872-3, the Post Office were for the first time able to present detailed estimates, Parliament up to that time merely been asked for a lump sum for the service. Early in the year the expenditure was estimated at £500,000, but at the close of the session detailed estimates were given, founded on a report by which the establishment was placed for the first time on a definite footing, the amount being £669,990. This was voted by Parliament, but proved insufficient to the extent of £204,955, 17s. 8½d. On a careful examination of the various items, the committee find that £64,000 of this deficit was due to the fact that the revised scale of salaries was authorized in July and August, and was allowed to date back from various periods in the previous financial year. The charge for stationery, estimated at £26,000, actually amounted to £49,000. A great portion of the deficit of this year remains, however, unexplained, except by the statement that the expenditure was under-estimated. The committee cannot but think that an experience of more than two years should have enabled the department to form a more correct estimate. No details are given respecting the excess of £109,947 on the accounts for 1873-4, information on this point having already been given in the comptroller and auditor-general's report. For 1874-5, the original estimate was £938,339, which was raised by supplementary estimates to £1,099,646. The Exchequer issues

for the year were £1,083,275, this not including the issue on account of the excess vote for 1873-4. The Post Office authorities trust that the appropriation accounts will show a slight margin in favor of the grants. Although the expenditure for the year has exceeded the original estimate by about £145,000, it is satisfactory that the excess has been for the first time reported to Parliament before the end of the financial year.

With regard to the second point to which attention was called—the causes of the great and increasing charges of the service of the telegraph branch as compared with the expenses of the companies—the committee report that the just and most obvious cause has arisen from the fact that the salaries of all the officials of the telegraph companies were very largely raised after their entry into Government service. Another cause is the fact that the supervising staff is much more costly than that formerly employed by the companies, and re-organization is suggested as opportunity may arise, with a view to the reduction of the cost of supervision. A further expense has been the compensation paid to linesmen whose services it was necessary to dispense with on the transfer of the telegraphs to the Government. Other reasons for increased expense were the greater advantages now given to the public, the rise in the price of wages and materials, the fares for transit of men and materials by railway, and the inclusion in the annual expenditure of charges which might strictly have been charged to capital. The percentage of the working expenses of the telegraph service to the gross receipts is very striking. It had gradually increased, until in 1874-5 it amounted to more than 96½ per cent., as against an average of 60 per cent. under the telegraph companies. "It will be perceived," says the committee, "that, during the first two years, when the wages paid by the companies continued at their old rate, a fair proportion between income and expenditure was maintained; but since 1872 the expenses have steadily increased, until they threaten to equal and even to exceed the receipts, leaving nothing to pay the interest on the capital borrowed for the acquisition of the telegraphs, or for the gradual reduction of the debt." The committee "are of opinion that, although it would be difficult for the Government to work the telegraph service as cheaply as it was worked by the Electric and International and other telegraph companies, a reasonable expectation might be entertained that the working expenses could be kept within 70 or 75 per cent. of the gross revenue, and the responsible officers of the Post Office Telegraph service should be urged to work up to that standard.

With regard to the third point of inquiry, it is pointed out that 449 telegraph stations do not pay even the allowance to the local postmaster for telegraph work and the cost of maintaining the instruments, irrespective of the maintenance of the wires. Although the Post Office is opposed to closing these offices, their previous expenditure showing that they will gradually become remunerative, the committee recommend a careful examination into each case, with a view to the ascertainment of the true position of profit and loss, and of action being taken upon the result. The partial abolition of postal surveyors, and transfer of their duties to provisional engineers, is recommended. An extension of the area of employment of the Royal Engineers in the maintenance of the telegraph system is suggested as a means of large economy. In the modification of the dual system of maintenance of the telegraph system by the railway companies and the Post Office, economies might also be effected, and the committee suggest whether arrangements outside the Act of 1868 could not be made with railway companies for the maintenance and renewal of the latter of all lines of tele

graphs on roads running parallel with, and adjacent to, their railways, such as loop lines from wires the railways into towns, at great distances from the railway, at rates less than those fixed under agreement provided for under clause 9. If railway companies, were found to be unreasonable, a bill to amend the existing Telegraph Acts should be introduced.

Although the number of the inland messages has increased from 6,000,000 under the Telegraph Companies to 20,000,000 during the Post Office administration, the working expenses have increased in a still greater ratio. The conclusion, says the committee, cannot be avoided that unless some check is put on the expenditure, or some means devised for augmenting the receipts, the management of the telegraphs will become a permanent charge on the finances of the country.

## SCIENTIFIC APPARATUS EXHIBITION.

The British government intends to have an exhibition of scientific apparatus, to be held at South Kensington, London, in 1876, the present arrangements being that it is to be opened on April 1. The exhibits are to include such instruments and apparatus as are employed for scientific research, experiment, and pupil teaching. It is also intended to include matters that will illustrate the progress of science and its technical applications, with others of a more special kind, but of general interest and value. In cases where original apparatus, etc., cannot be sent models, drawings, and photographs will be admitted. In certain cases apparatus may be arranged in such successive order that the steps of scientific investigation may be readily followed. A valuable provision will be that of, as far as found practicable, systematically explaining and illustrating the use of the apparatus, etc. The entire exhibition will consist of eighteen sections, embracing arithmetic, geometry, measurement, kinematics, statics, dynamics, molecular physics, sound, light, heat, magnetism, electricity, astronomy, applied mechanics, chemistry, meteorology, geography, geology and mining, mineralogy, crystallography, etc., and biology. Instruments representing each of these subjects will be shown. The committee selected to carry out the object of the exhibition embraces some of the most eminent men in each department above named, the engineering branch being specially well represented.

## THE ITALIAN TELEGRAPHS.

The reports of the Italian Telegraph Service show that its development has very largely increased since 1861, when the present constitution of the empire was established. The following extracted statistical table of comparison will briefly show the increase:

	1861.	1873.
Length of lines.....	4,971 miles.....	13,670 miles.
Length of wires.....	8,078 ".....	43,497 "
Number of offices.....	225.....	1,622
Number of instruments...	400.....	2,800
Gov't messages per annum	180,000.....	300,000
Private messages ".....	600,000.....	5,040,000

## Business Notices.

The Western Electric Manufacturing Company of Chicago have made a contract to furnish their popular Needle Annunciator to the St. James Hotel, Richmond, Ind.

The St. James has about seventy rooms.

The Annunciator recently placed in the Wiler House at Mansfield, O., by the Western Electric Manufacturing Company is in full operation, and the proprietors express themselves as greatly delighted with it.



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## Insulated Wire Manufacturers.

INSTRUMENT AND OFFICE WIRES,

FLEXIBLE CORDS, CABLES,

HEAVY INSULATED LINE WIRE,

RESISTANCE WIRE.

WIRES OF EVERY VARIETY OF INSULATION.

## GEO. H. BLISS & CO.,

220 Kinzie St., CHICAGO, ILL.

TELEGRAPH INSTRUMENTS AND SUPPLIES in great variety, of the latest patterns and highest finish.

Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on instruments of our manufacture, when remittance accompanies order.

GEO. H. BLISS & CO.

### The "Snapper" Sounder.



PATENTED MARCH 2, 1875.

Polished, 30c., or 6 for \$1.50.

Polished nickel-plated base, 50c., or 6 for \$2.

Polished, with knob and screw fastenings, 75c.

PRICE  75 CENTS.

Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

## PARTRICK & CARTER,

THE ONLY MANUFACTURERS OF THE ORIGINAL

## GIANT SOUNDER, PERFECTED,

Patented February 16, 1875.

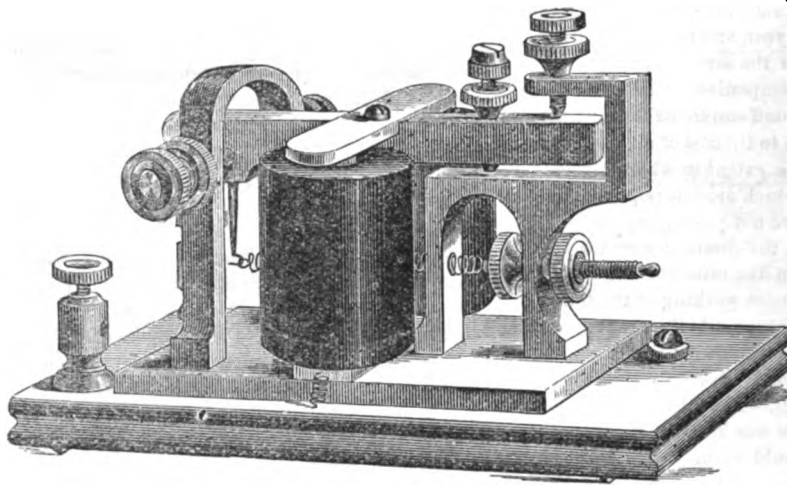
BEWARE OF WORTHLESS IMITATIONS.

OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND, SINGLE AND DOUBLE,

with COTTON, LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every instrument warranted perfect.

PRICE, sent C.O.D., \$7.50,

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

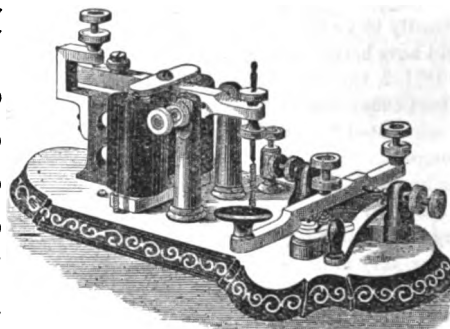
Price of single instrument, good for one mile or less, without Battery, &c. \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7 50

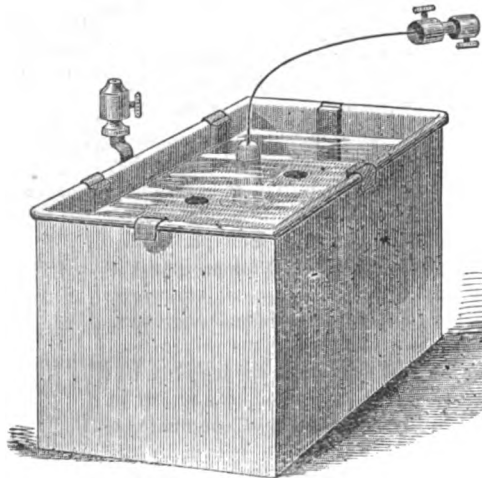
Price of single instrument, good for one to twelve miles, without Battery, &c. 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8 50

This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.



## EAGLE'S METALLIC BATTERY.



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

For OPEN CIRCUITS, where all other gravity batteries are ACKNOWLEDGED FAILURES, the Eagle's Battery is found to be in every respect A PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - - - \$2.25  
No. 2, Round " " - - - 2.00

PARTRICK & CARTER, Sole Agents,

38 South 4th Street, PHILADELPHIA, Pa.

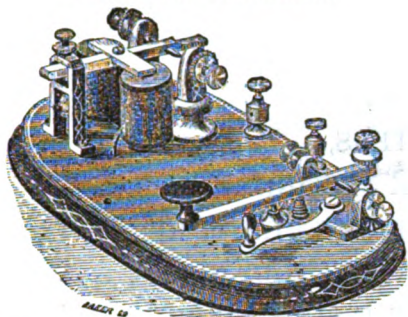


# Western Electric Mfg. Co., CO-OPERATIVE MFG. CO., 218 Pear St., Philadelphia.

220 KINZIE STREET, Chicago, Ill.

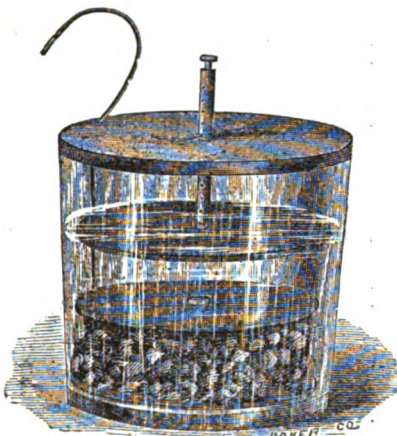
## Celebrated PRIVATE LINE OUTFIT,

THE BEST IN THE MARKET.



## PRIVATE LINE INSTRUMENT.

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on a line from a few feet to ten miles in length.



## BLISS' RESERVOIR BATTERY.

This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition. With each "Private Line Outfit" is furnished one Private Line Instrument, one cup of Bliss' Reservoir Battery, the necessary Chemicals, Wire for connections, and a Manual.

### PRICES:

PRIVATE LINE OUTFIT, complete, - - - \$10 00  
INSTRUMENT ONLY, - - - 8 00  
BLISS' RESERVOIR BATTERY, per cell, - - - 2 00

### DISCOUNTS

A discount of twenty per cent will be allowed when remittance is made in advance. Remit by express, registered letter, postal order, or draft.

In ordering, state length of line so that the resistance of instruments may be proportioned accordingly.  
Send for Circular. Liberal terms to Agents.

**WESTERN ELECTRIC MFG. CO.,**  
**Chicago, Ill.**

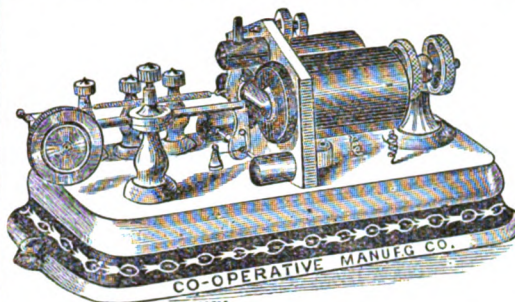
**NO OTHER MAIN LINE SOUNDER**  
has proven as PERFECT an INSTRUMENT as that made by us the past two years.

**NO RESISTANCE, EASY ADJUSTMENT AND  
HANDSOME APPEARANCE COMBINED.**

No other instrument offered for this purpose has the advantages secured to ours. See other columns of this paper.

**WATTS & COMPANY,**  
No. 47 Holiday Street,  
BALTIMORE, MD.

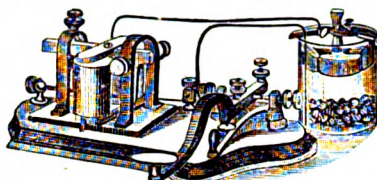
Send for Catalogue and Price List.



W. U. Pattern Relay.

This Relay is acknowledged to be the best in use.  
Is finely finished.

Price, - - - \$16.



Co-operatives' Learners' Instrument No. 1.

A complete outfit embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practising or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined.

The above instrument is nicely finished in brass, and not like other manufacturers' that are made of cast iron.

Price of No. 1 Instrument when money is sent  
in advance, - - - \$8 00  
With Battery, - - - 9 50

When sent C. O. D., - - - 8 50  
With Battery, - - - 10 00

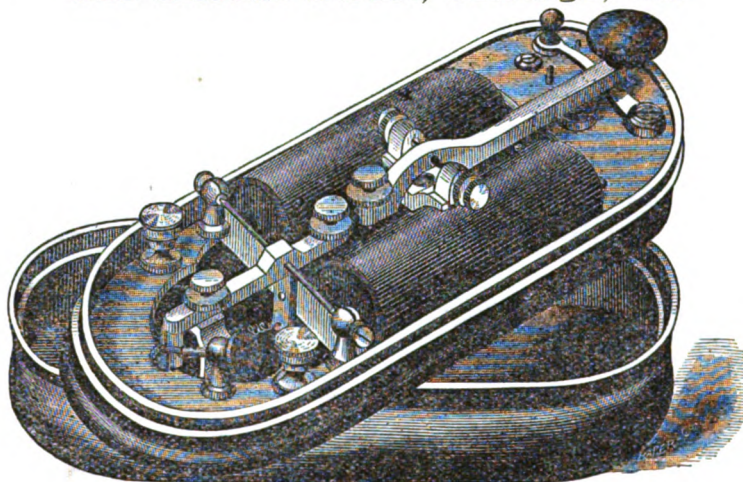
N. B.—Either of the above Instruments can be made to work on a circuit from one to twelve miles by Winding Magnet with fine wire which will make cost of Instrument one dollar extra.

Send for Price List.

**W. R. BALDWIN, Manager, 218 Pear Street, Philadelphia.**

# WESTERN ELECTRIC MANF. CO.

220 Kinzie Street, Chicago, Ill.



## POCKET RELAY,

PATENTED JULY 13th, 1875.

Our Patent Pocket Relay has an improved key, large enough to be durable and for practical work. It has an independent circuit closer. The sounding lever is supported by adjustable trunnion screws, and can be readily removed at any time, or adjusted as finely as a relay armature. The adjustment spring is conveniently arranged, and can be repaired with ease. The instrument gives a splendid sound. The case is hard rubber and the same in length and width as the Caton Pocket Relay Case, and a trifle deeper.

It is pronounced the best finished and most serviceable Pocket Instrument made.

**PRICE \$18.00.**

Twenty per cent. discount when money is sent with order.

**WESTERN ELECTRIC MANUFACTURING COMPANY.**



# WESTERN ELECTRIC MANUFACT'ING COMPANY.

Manufacturers and Dealers in Electrical Goods and Apparatus,

220 KINZIE STREET, CHICAGO, ILL.

MORSE INSTRUMENTS,  
PRINTING TELEGRAPH EQUIPMENTS,  
BURGLAR ALARMS,  
MEDICAL APPARATUS,  
EXPERIMENTAL APPARATUS,  
BROOKS' INSULATORS,

BATTERIES,  
CHEMICALS,  
STATIONERY,  
TOOLS,  
POLES,  
KENOSHA INSULATORS,

GRAY PRINTERS,  
TYPE WRITERS,  
OFFICE FITTINGS,  
OFFICE FURNITURE,  
ELECTRIC BELLS,  
CAUVET INSULATORS,

## INSULATED WIRES. INSULATORS. MERCURIAL FIRE ALARMS.

HOTEL AND HOUSE  
ANNUNCIATORS.

POCKET INDUCTION  
MACHINES.

LEARNERS' OUTFITS.

BOOKS ON ELECTRI-  
CITY.

ORTON'S MESSAGE  
CLIPS.

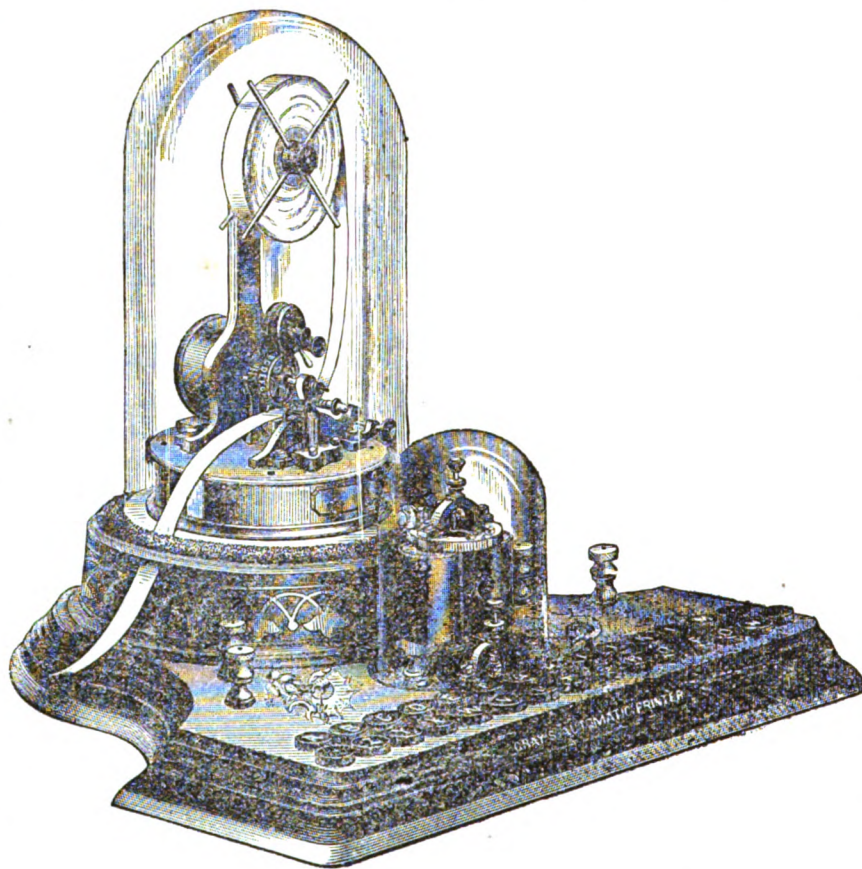
ORTON'S SAFETY  
MESSAGE HOOKS.

MANIFOLD PAPER.

COMPOUND WIRE.

BLISS' MANUALS.

WESTERN UNION  
SWITCHES.



CABLES,  
BATTERY UTENSILS,  
LINE MATERIALS,  
GALVANIZED WIRE.  
OFFICE WIRE.  
MAGNET WIRE.  
ANNUNCIATOR WIRE.  
KERITE WIRE.  
GUTTA PERCHA WIRE.  
CALLAUD BATTERY.  
BLUE VITRIOL.  
CATON REGISTERS.  
CATON RELAYS.  
PHELPS RELAYS.  
BOX RELAYS.

PATENT LEGLESS KEYS.

PATENT POCKET RELAYS.

GRAY CUT OUTS

Our facilities for the Manufacture of Electrical Apparatus are unrivalled.

We invite correspondence and solicit Patronage.

## WESTERN ELECTRIC MANUFACTURING COMPANY.

CHICAGO, ILL.

ANSON STAGER, President.

E. M. BARTON, Secretary.

ELISHA GRAY, Superintendent.

GEO. H. BLISS, General Agent,



**WATTS & COMPANY,**No. 47 HOLIDAY STREET,  
BALTIMORE, MD.

**SUPERIOR TELEGRAPH INSTRUMENTS, RELAYS,  
SOUNDERS, KEYS, OFFICE WIRE, BATTERIES  
OF EVERY DESCRIPTION,  
SWITCHES, GALVANOMETERS,  
RESISTENCE COILS.**

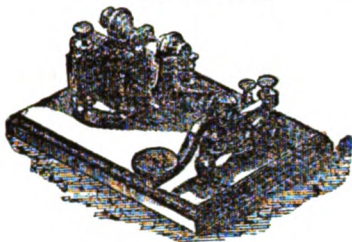
**A COMPLETE STOCK OF EVERYTHING FOR THE TELE-  
GRAPH OFFICE OR CHEMICAL LABORATORY.**

Special attention given to repairing Scientific instruments.  
Several of our workmen having served their time in the most  
prominent European manufactories, enables us to guarantee  
satisfaction.

SEND FOR CATALOGUE AND PRICE LIST.

**CHARLES WILLIAMS, Jr.,**  
109 COURT STREET, BOSTON.

[ESTABLISHED 1856.]



\$11.50

MANUFACTURER ON

**Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.**

**GLASS CARDS**

RED, BLUE, WHITE  
Clear and Transparent.  
Your Name Beautifully  
Printed in GOLD on 1

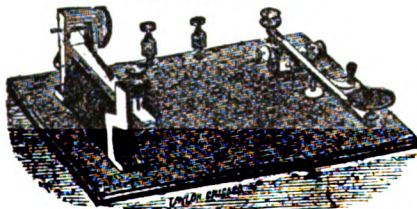
dozen for 50c. post paid, 3 doz. \$1. Must have Agents Every-  
where. Outfits, 25c. Samples 10c. F. K. Smith & Co. Bangor,  
Me.

**\$12 a day at home.** Agents wanted. Outfit and terms  
free. TRUE & CO., Augusta, Maine.

**THE AMATEUR  
Telegraph Apparatus**

Comprises SOUNDER, KEY CUP OF BATTERY, CHEMI-  
CALS, WIRE AND MANUAL.

Several thousand of these instruments already sold,  
They give good satisfaction.

**PRICES:**

AMATEUR OUTFIT, COMPLETE, No. 1, - - -	\$7 50
" " " No. 2, - - -	6 50
" SOUNDER AND KEY, No. 1, - - -	6 50
" " " No. 2, - - -	5 50
" BATTERY, PER CELL, - - -	65

**DISCOUNTS.**

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

**GEO. H. BLISS & CO.,**

220 KINZIE STREET,

CHICAGO, ILL.

**BUNNELL'S  
NEW GIANT SOUNDERS PERFECTED.**

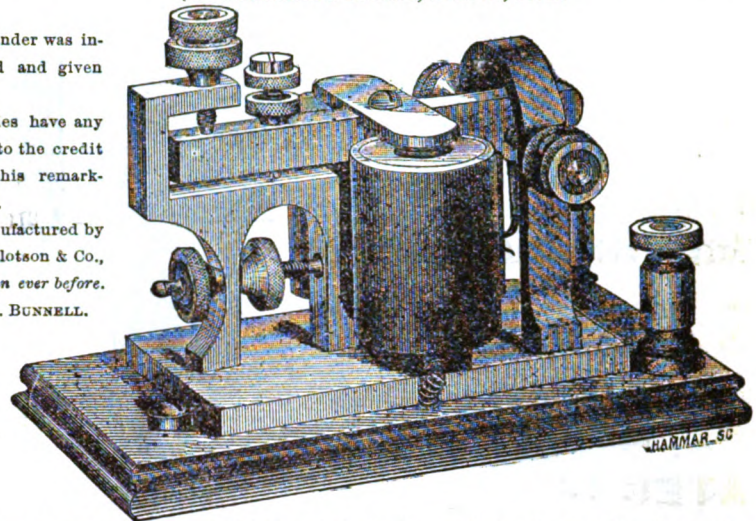
[J. H. BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was in-  
vented, patented and given  
its name by me.

No other parties have any  
claim whatever to the credit  
of originating this remark-  
able instrument.

It is being manufactured by  
Messrs. L. G. Tillotson & Co.,  
more perfectly than ever before.

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable  
and substantial shape.

They give enormous sound with but little Local Battery power.  
Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder  
is desired.

**PRICE, \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

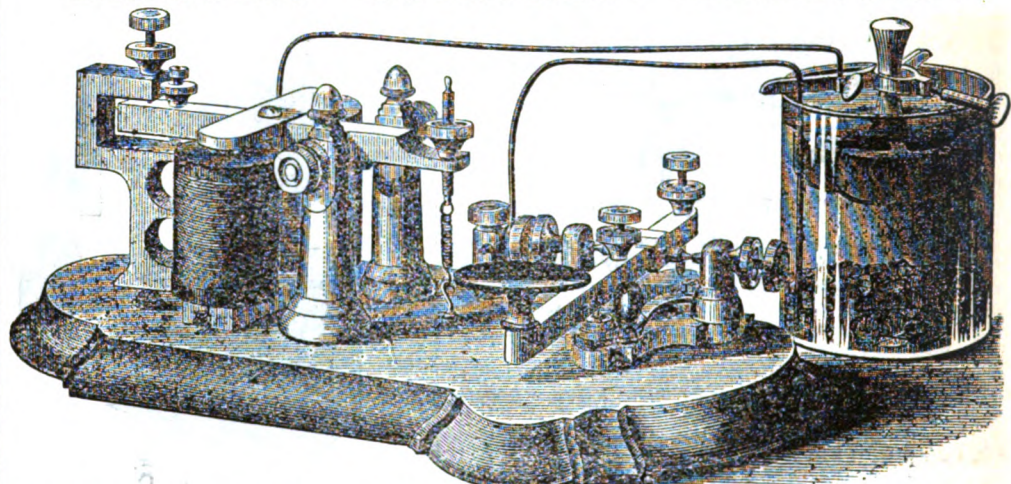
**L. G. TILLOTSON & CO.,**

Cincinnati Agency, H. D. ROGERS &amp; CO.,

22 West 4th Street, Cincinnati, O.

8 Dey Street, New York,

54 South 4th Street, Philadelphia,

**DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.****BUNNELL'S  
LEARNERS' INSTRUMENT PERFECTED!**

**Complete and Perfect, full-sized Sounder and Key complete, with  
Book of Instruction, Battery, Wire and all necessary Materials.**

[These instruments have been greatly improved in their working qualities and in the style in which they are finished.  
Those having the latest improvement in their construction are those manufactured only by Messrs. L. G. TILLOTSON & Co.  
JESSE H. BUNNELL.]

These Sets are made in the best manner, and are just exactly the thing wanted

**FOR LEARNERS' USE,  
FOR TELEGRAPH SCHOOLS.**

Or FOR SHORT LINES, from a few feet to 12 miles long.

Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials  
to put in operation, singly or on a short line - - - - - \$8 50  
Learners' Instrument, without Battery &c., - - - - - 6 50  
Ornamental Learners' Instrument, Rubber Covered Coils, &c., - - - - - 7 50  
Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines  
up to twelve miles in length, \$1.00 in addition to above prices.

A copy of Smith's Manual, new and enlarged edition (See advertisement in another column) sent with each complete  
outfit of BUNNELL'S PERFECTED LEARNERS' INSTRUMENT.

These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order  
or Draft.

**L. G. TILLOTSON & CO.,**

8 Dey Street, New York, and 54 South 4th Street, Philadelphia.

Cincinnati Agency, H. D. ROGERS &amp; CO., 22 West 4th Street, Cincinnati, O.

**DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.**



WESTERN UNION TELEGRAPH CO.,  
TREASURER'S OFFICE,  
NEW YORK, SEPTEMBER 10th, 1875.

### DIVIDEND No. 34.

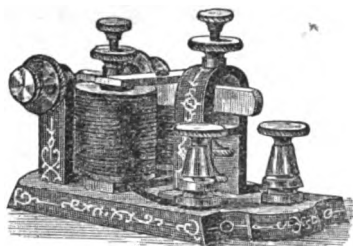
The Board of Directors have declared a Quarterly Dividend of **TWO PER CENT.** on the capital stock of this Company, from the net earnings of the three months ending September 30th instant, payable at the office of the Treasurer on and after the 15th day of October next, to Shareholders of record on the 20th day of September.

The transfer books will be closed at three o'clock on the afternoon of the 20th instant and opened on the morning of the 16th of October.

R. H. ROCHESTER,  
Treasurer.

## A Great Reduction in Prices.

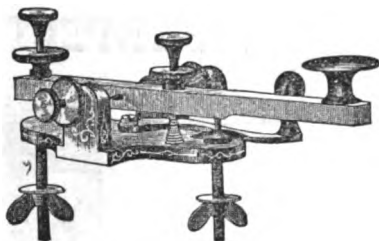
I am now making a specialty of my PHIL. SHERIDAN SOUNDER AND KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



PHIL. SHERIDAN, \$4.00.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. Extra.



PHIL. SHERIDAN KEY, PRICE, \$2.00.

You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, etc., etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Callaud Battery, 1 lb. Blue Vitrol, Connection Wire, Book of Instruction, etc., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

A. B. LYMAN,  
91½ SENECA ST., Cleveland, Ohio.

CALIFORNIA AGENCY  
FOR

## Partrick & Carter's Instruments.

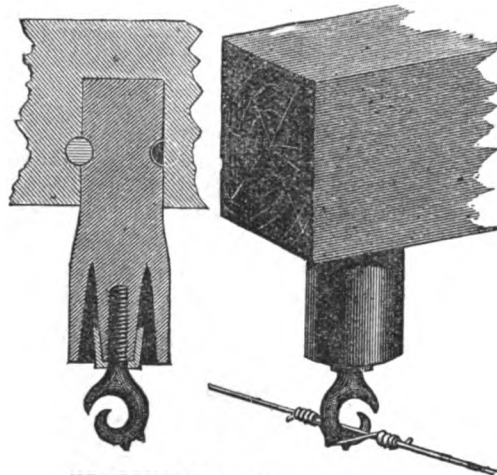
NEW PERFECTED GIANT SOUNDER,  
IMPROVED CURVED KEYS, LATEST AND BEST,  
CHAMPION LEARNERS' INSTRUMENTS,  
SPLENDID NEW POCKET RELAYS, AND  
REGULAR RELAYS.

Address

GEO. M. POMEROY, San Jose, California.

## THE KENOSHA INSULATOR CO.

Telegraph Companies and Telegraph Constructors  
are invited to examine the merits of our new and improved  
patterns of



### KENOSHA CARBON INSULATORS!

These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellent of moisture, which does not change nor deteriorate after years of exposure to the weather.

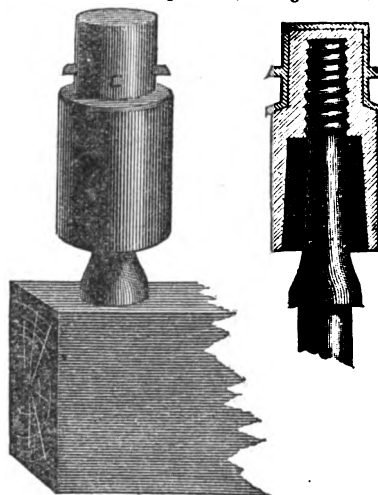
THE KENOSHA INSULATOR has now stood the test of Six Years' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average, MORE THAN TEN TIMES AS GREAT during the prevalence of rain or fog.

Immense numbers of these Insulators are in use by  
The North Western Telegraph Co.,

The Western Union Telegraph Co.,  
as well as many RAILWAY and OTHER TELEGRAPH LINES,  
and they have invariably been found to give

### ENTIRE SATISFACTION.

Besides the Suspension Insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



### CAP INSULATOR, WITH PIN OR BRACKET,

which is fitted with a zinc protection, as shown in the above figure,

### THE KENOSHA INSULATOR

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice, CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators. These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all Insulators furnished by us to prove entirely satisfactory.

THE KENOSHA INSULATOR CO.,  
KENOSHA, WIS.

L. G. TILLOTSON & CO.,  
8 Dey St., New York,  
GENERAL EASTERN AGENTS.

THE WESTERN ELECTRIC MFG. CO., of Chicago,  
GENERAL WESTERN AGENTS.

WANTED—BY YOUNG MAN, A FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 70, Janesville, Wis.

\$5 to \$20 per day at home. Samples worth \$1 free.  
SRINSON & Co., Portland, Maine.



## OPERATORS' CHANCE!

Electrotype Cards, of Keys, Sounders, Relays, etc., with your name, handsomely printed on 25 assorted cards, for 25 cents, or 75 with name, business, etc. for 50 cents. Also R. R. Cards, samples of Electrotype Cards 3 cents. Agents allowed 25 per cent. to take orders for the finest and largest assortment of fashionable Visiting Cards, with Circulars, etc. mailed for 25 cents.

F. P. MUNN,  
Address,  
Clyde, Wayne County, N. Y.

## ORTON'S

## PATENT PENCIL HOLDER.

This Holder is intended to save the last half or third of the pencil.

### DIRECTIONS:

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 25 cents each. Sent by mail on receipt of price.  
Price per dozen, 2.50.

GEO. H. BLISS & CO.,  
CHICAGO, ILL.

## EUGENE F. PHILLIPS,

MANUFACTURER OF

## REED & PHILLIPS' PATENT INSULATED TELEGRAPH WIRE,

PATENT RUBBER-COVERED WIRE,

PATENT ELECTRIC-CORDAGE, CABLES, etc., etc.

No. 20 CONDUIT STREET,  
PROVIDENCE, R. I.

## THE LECLANCHE BATTERY.

(PATENTED.)



This is the ONLY one which which is perfectly suitable for all open circuit work such as Electric Bell ringing, hotel and house annunciators, burglar alarms, signals, laboratory experiments, etc., or wherever a battery is wanted which is clean, free from acids, always ready for use, and does not consume when not in operation.

IT LASTS, WITHOUT RENEWAL, FROM SIX MONTHS TO SEVERAL YEARS, according to use.

IT DOES NOT FREEZE, EMITS NO ODOR WHATEVER,  
and

DOES NOT GET OUT OF ORDER.

For these reasons it is the only suitable and SAFE battery FOR BELLS, etc., in Private Houses where the Battery must be CLEAN, RELIABLE, and always ready for use.

The electro-motive power of Grove being 100, this is 75, and Daniells 50; or three cells of this battery are equal to four cells of the Daniells.

Liberal discounts to the trade. For circulars, prices, etc., send to

The LECLANCHE Battery Co.  
No. 40 West 18th Street.

Or to L. G. TILLOTSON & CO.,  
Sole Agents,  
No. 8 Dey Street.

PHILADELPHIA: 54 South Fourth Street.



**AMERICAN FIRE ALARM.**

AND  
**POLICE TELEGRAPH.**

**GAMEWELL & CO., PROPRIETORS.**

**NO. 62 BROADWAY, NEW YORK.**

**J. W. STOVER,**

General Agent and Superintendent.

**L. B. FERMAN, Chicago, Ill.**

General Agent for the West and Northwest.

**R. DOWELL, Richmond, Va.,**

Special Agent for Virginia and North Carolina.

**J. A. Brenner, Augusta, Ga.,**

Special Agent for Georgia and South Carolina.

**L. M. MONROE, New Canaan, Conn.,**

Special Agent for New England.

**ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,**

San Francisco, Cal., Special Agents for California, Oregon and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

**AUTOMATIC PLAN,**

is now in operation in the following cities, to which reference is made for evidence of its great **SUPERIORITY, VALUE and UNIFORM RELIABILITY;**

Albany, N. Y.	New Orleans, La.
Alleghany, Pa.	New Haven, Conn.
Boston, Mass.	Newark, N. J.
Buffalo, N. Y.	Omaha, Nebraska.
Baltimore, Md.	Philadelphia, Pa.
Chicago, Ill.	Pittsburg, Pa.
Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass.	Quebec, L. I.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
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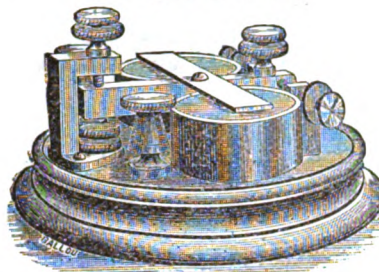
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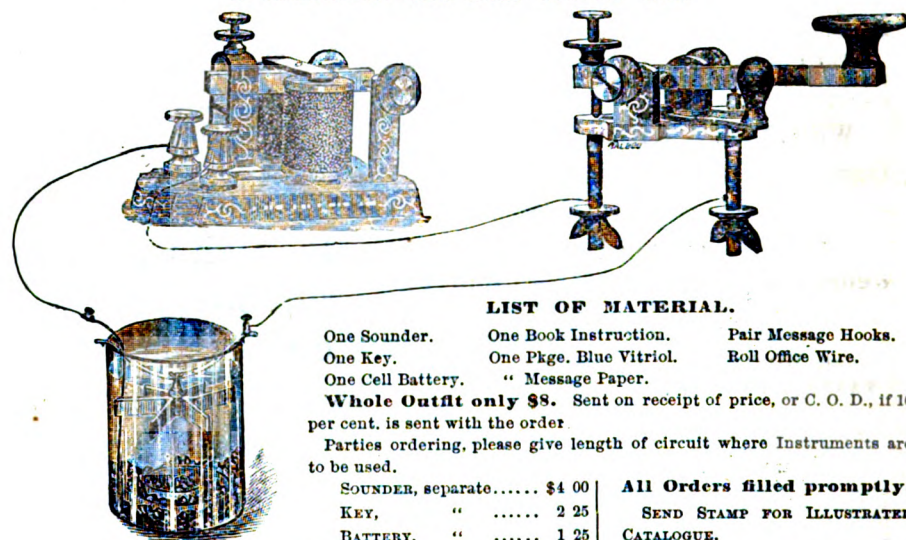
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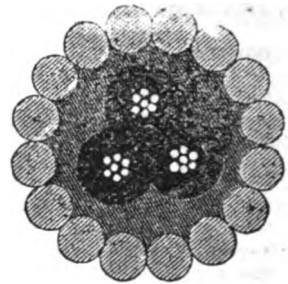
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 21.

NEW YORK, NOVEMBER 1, 1875.

WHOLE NO. 192.

## THE EUROPEAN MORSE INK-WRITER.

In the earlier experiments of Morse, as far back as 1836, methods of marking the paper by the direct action of the armature lever were tried by him. Not only a common lead pencil, but fountain pens of various kinds, and a small printing wheel or roller was employed at different times. The latter, together with a sponge which was placed in contact with it for the purpose of supplying it with ink, were mounted upon the armature lever above the paper strip. All these devices were used with more or less success, but were finally abandoned in favor of the well-known style or steel point, by which the characters are embossed upon the paper. Wherever it has not been superseded by the sounder, the registering apparatus constructed upon this principle has been in use in the United States, with immaterial modifications, from the opening of the first line in 1844 up to the present time.

The Morse system was introduced on the continent of Europe to a considerable extent prior to 1850. The earliest instruments used there, were modelled very closely after the American instruments of that date, and the embossing process was used almost exclusively for many years. Experiments were constantly being made however, with a view of substituting for it some effective and convenient method of recording by means of ink, or some similar coloring matter. The earliest apparatus of this kind which appears to have been practically successful was that of Thomas John of Prague, an assistant engineer in the Austrian Telegraph service, and which was first used in the Central telegraph station in Vienna in 1854. It differed from the original plan of Morse in several respects. The marks were made upon the paper by means of a small printing wheel kept constantly revolving in a dish of colored fluid, and pressed gently against the paper when the armature of the electro-magnet was attracted. The object of John's arrangement was to lessen the force required for marking the paper, so that the instrument might be worked directly in the main circuit, without the use of relays and local batteries. In this respect, the apparatus, at least, with its numerous subsequent improvements, has been a complete success.

John's arrangement was afterward taken to Paris, where it underwent important modifications by Digney, which not only simplified its construction, but greatly improved its working.

The Digney ink writer is shown in fig. 1, in the form in which it is extensively used in Europe. The clock-work is driven by a coiled main-spring, and is enclosed within a brass case S S, which protects it from dust and injury.

On the sides of the case, in front, are the paper rollers

W and W<sub>1</sub>, the former being carried by the mechanism, and the latter by friction. The paper strip *p* passes between these rollers, and the pressure of the upper upon the lower roller is regulated by a spring which is adjustable by means of the screw Z.

When a strip of paper *p* is to be inserted, the end is taken from the roll on the paper reel P, passed through the slit *g*, and under the guide-pulley *i*, thence under the printing wheel *a*, and between the paper rollers W and W<sub>1</sub>, the latter being lifted for the purpose by means of a lever *q*, when shoved to the left. After passing between the rollers the paper moves along the slide *e*. The electro-magnet is

lates the play of the armature lever. The brake *j*, serves to stop and start the clock-work when a communication is to be received.

The roller *t* does not require to be inked oftener than once a day, even when the instrument is constantly at work. The clock-work is arranged to run about an hour, and to carry the paper along at the rate of four feet per minute. The paper used is quite narrow, and is only used once.

This instrument, working as it does without the aid of relays or local battery, on lines of ordinary length, has become a great favorite with the telegraphic employes in all parts of Europe. The deciphering of the characters when written in ink is much less fatiguing than when they are embossed, especially if the light is at all imperfect. The Digney instrument has given such satisfaction to the French Administration, that it has been adopted by them for use on all the government lines both in France and in the Colonies. The satisfactory operation of the Digney instrument is no doubt, due in a great measure to the nice discrimination between the sizes of the movable and fixed portions of the apparatus, which has greatly reduced the inertia of the armature, lever, etc., while retaining abundant strength to effect the marking with distinctness.

A series of interesting experiments was made by Mr. Guillemin in 1862, in order to determine the maximum number of elementary signals, and from this the number of words it was capable of recording in a given time. He employed a transmitting apparatus, consisting of four wheels mounted upon a common axis; the first of which transmitted dots, the second dashes, whilst the two others served to discharge the static electricity from the line after each signal.

The words *France* and *Paris*, which in the the Morse alphabet represent an average of the length of the words in the language, were repeated in a line of 470 miles in fine weather 30 times per minute, and in wet weather he easily attained the rate of 40 words per minute. On a line of 280 miles the speed of recording was augmented to 75 words per minute.

Another style of French ink-writer is arranged, with an endless chain in place of the printing roller *a*, running over two pulleys moved by the clock-work of the apparatus. It receives the ink from a roller placed above it, as in Digney's instrument, and in like manner the paper is pressed against it by the armature lever.

The ink-writer of Siemens and Halske, which is represented in fig. 2, is very largely used in Germany, and also on the government telegraph lines in Great Britain and India. It is regarded as an improvement upon the apparatus of Digney, in which the writing

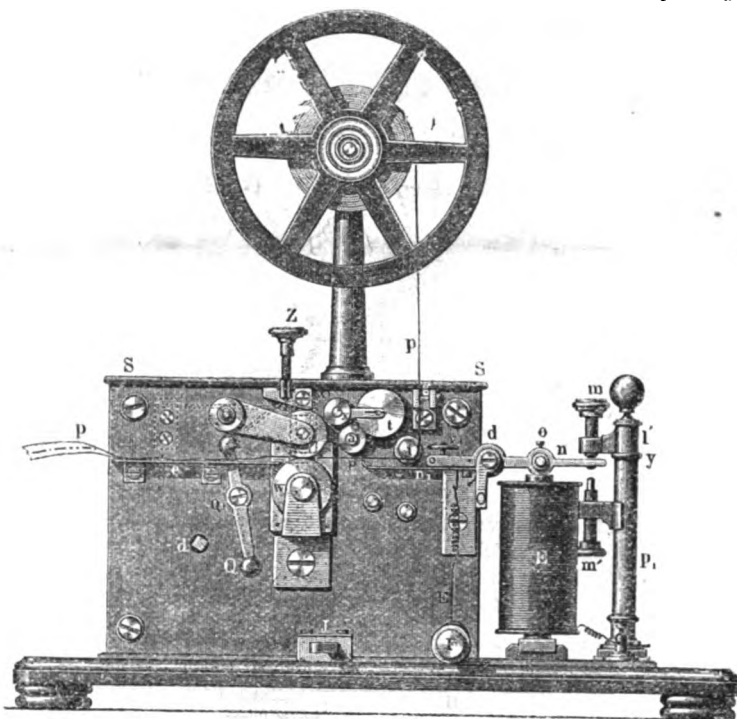


Figure 1.

seen at E, *o* is its armature, and *n n*, the writing lever. The latter is firmly attached to the armature and turns upon an axis at *d*. It is provided with a retracting spring E, adjustable by means of the screw F.

When the armature is attracted to the poles of the electro-magnet, a knife-edge, which forms the end of the spring *n*, is raised, and lifts the paper against the printing wheel *a*, which revolves in the opposite direction to the movement to the paper, against which it rubs so long as the armature is attracted. When the current ceases, the spring E pulls back the lever, and the paper strip is removed from contact with the wheel *a*. The ink-roller *t* is of felt or flannel, is occasionally moistened with fresh oil color, black or blue, by means of a brush. The printing-wheel *a*, which has quite a sharp edge revolves in contact with the ink-roller, and is by this means kept constantly supplied with ink. The screw stops *m* and *m*, regu-

is sometimes rendered indistinct by the thickening of the ink upon the roller in warm weather; it is liable, also, to be blotted when the ink upon the roller is being renewed, unless considerable care is exercised. In the Siemens-Halske instrument these difficulties seem to be completely overcome. The principal difference between this apparatus and that of Digney consists in the arrangement of the printing apparatus. The parts are in fact reversed. The printing wheel revolves with its lever half immersed in a dish of coloring liquid, while it is lifted by the action of the armature up against the paper which runs above it, instead of the paper being moved against the printing wheel. This was in fact John's original mechanical arrangement, but was of course but incompletely worked out by him at that early day.

The clock-work is enclosed in a case with brass sides, having plates of glass inserted at the top and ends, and is driven by a coiled main spring which is wound up by the key A. The paper strip passes from the reel P around the guide pulleys 1, 2, 3, and 4, and thence between the paper rollers  $w$  and  $w_1$  and so out. The roller  $w$  is carried by the clock-work at a uniform speed, while  $w_1$  presses against it and is carried by friction. The latter may be lifted by the handle  $d$  in order to insert the paper conveniently. The inking wheel J is also caused to revolve by the clock-work, its axis being arranged as shown in fig. 3, a swivel-joint U connecting it with the frame S, S, so that it may be lifted by the armature without interfering in the least with the continuous revolution, which is imparted to it through the pinion at U. The armature  $a$  of the electro-magnet E, E is attached to the lever C, which turns upon an axis at B. The arm C, attached to the lever C takes hold of the arbor of the printing wheel J, as shown in figures 2 and 3, and raises the latter whenever the electro-magnet attracts its armature. The inking wheel J, whenever it is lifted, revolves with its lower half in the ink reservoir L, L, which is filled through an opening beneath the cover  $l$ . A spring G, fixed upon the writing lever C, is arranged with its free end almost in contact with the periphery of the wheel J, for the purpose of removing therefrom any superfluous ink.

The retracting spring of the lever C, is attached to an arm  $h$ , and adjusted by a screw  $f$ , as in the American instruments. The clock-work is stopped and started by means of a friction brake, H. As this apparatus is intended to work on the main circuit, the electro-magnet E E, is also made movable, like that of a relay, the adjustment being effected by a lever beneath the base, controlled by the screw  $g$ .

The original direct working polarized ink-writer of Siemens and Halske (fig. 4) is based upon the principle of the polarized relay, the devices for marking the paper being similar in principle to those of John and Digney. The arrangement of the clock-work

and mainspring within the case is similar in all respects to that of the instruments previously described. The printing wheel J is turned by the clock-work and receives its ink from the felt roller K, which rests upon it, and turns with it by friction. G, G, are the paper rollers, which draw the strip

The polarized tongue or armature C C, of soft iron, is pivoted at B, within a slot cut in the south pole S S of the permanent magnet, and its opposite end is free to vibrate between the angular soft iron pole pieces N N, of the electro-magnet E E, the stroke of the armature being limited by the upper and lower

adjustable screw stops D D. Attached to the lever C C is the writing spring  $d$ , bent upwards as shown in the figure, and capable of a slight adjustment by means of the screw  $s$ .

To operate this instrument a pole-changing key is required, the dots and dashes being sent by a current of one polarity, usually positive, and the spaces by a negative current instead of a break. This dispenses altogether with the retracting spring and renders the instrument practically self-adjusting. When the main current is strong the pole-pieces N and N, are adjusted at a greater distance from the tongue C than when it is weak. This adjustment is effected by means of the screw F.

If a positive current passes through the electro-magnet E E, its effect is to increase the north magnetism already existing in the pole N and to diminish or neutralize entirely that already existing in the pole N,. Hence the tongue or armature is attracted to the pole N; the spring arm  $d$  is lifted and presses the moving strip of paper against the sharp edge of the inked printing wheel J. When the current is reversed to form a space between two successive signals, the pole N, in turn becomes the most powerful, the tongue C is attracted upward and the pressure of the spring arm  $d$  removed from the paper strip. The apparatus will also operate as well with the polarized as with the ordinary electro-magnet when the current

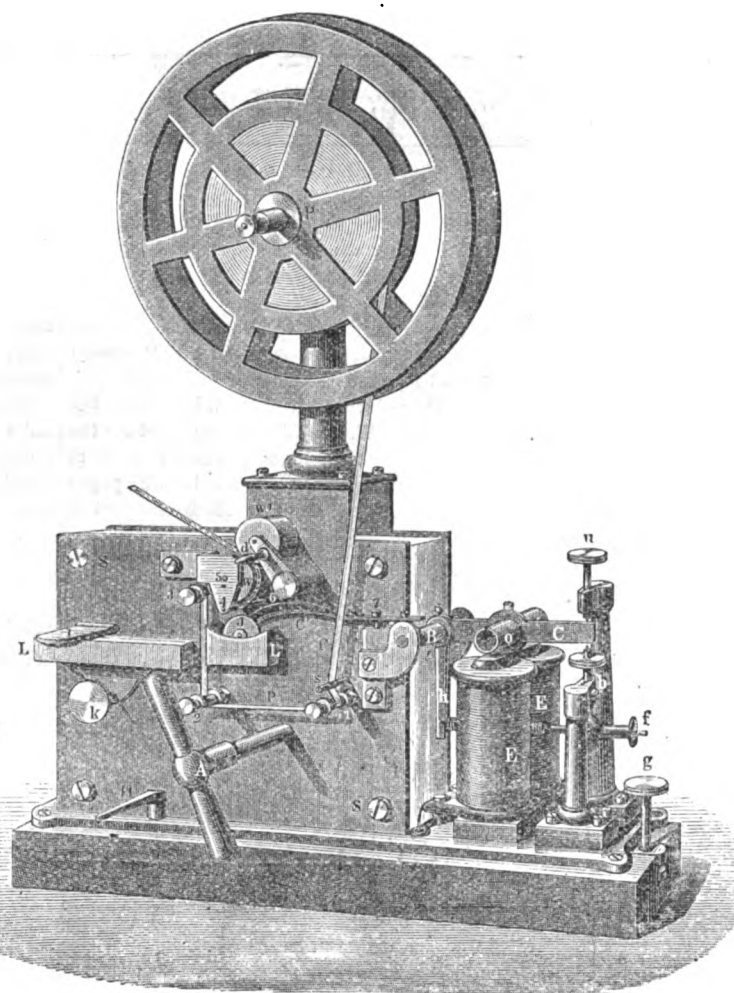


Figure 2.

from the reel T, underneath the printing wheel J, against which it is pressed whenever the end of the printing lever  $d$  is raised; the whole process, as far as marking the paper is concerned, being almost pre-

rents are in one direction only, but it is preferable to use the reversals, especially when the circuits are long or badly insulated. Whenever necessary the apparatus is arranged with a self-starter and with an alarm bell.

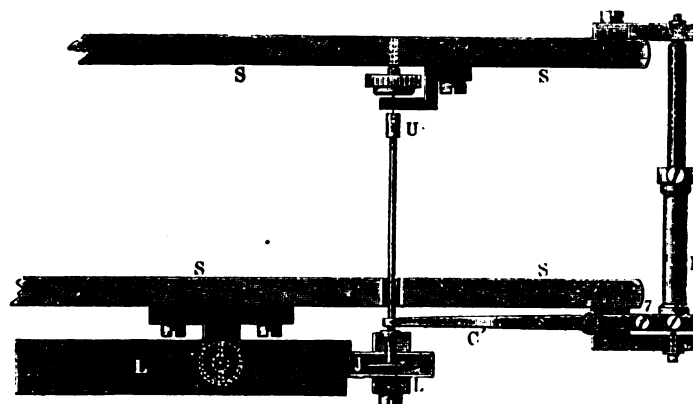


Figure 3.

cisely like that employed in the Digney apparatus. The electro-magnet is arranged exactly like that of a Siemens polarized relay. The coils of the magnet E E, are placed horizontally one above the other. At the back of the instrument the electro-magnet is secured by its yoke to the north pole of an angularly bent permanent magnet of considerable power, whose south end is brought round so as to project from the front of the instrument, as shown at S S,

More recently an improved construction of the direct working polarized ink-writer (fig. 5) has been devised by Siemens and Halske, which is unquestionably the most perfect apparatus of the kind, in every respect, that has yet been produced. The improvements in this instrument relate entirely to the writing apparatus, the arrangement of the polarized magnet and tongue being identical with that in fig. 4, and the same letters of reference indicating like parts. The axis of the printing wheel J is provided with a swivel, as in fig. 3, and turns with its lower half in the ink reservoir L, which is supplied through

the cover  $l$ . The paper runs from the reel T, around the guide pulleys 1, 2, 3, 4, and thence between the paper rollers G and G, and out over the guide 6. In all other respects the operation of the instrument is the same as that described in the preceding paragraph.

The great advantages of the direct working polarized ink-writer over any other form of Morse recording apparatus may be summed up as follows:



1. The instrument is worked by a main current of moderate strength, dispensing altogether with relays and local batteries, thus simplifying the equipment of an office in a marked degree, and increasing the reliability of working.

2. The instrument may be set up without reference to the direction in which the light falls upon it, which is not the case with the embossing register generally used in this country.

3. The supply of ink is uniform, and the marks upon the paper invariably distinct and perfect.

4. The movement of the printing wheel need not exceed the ordinary movement of the armature of a relay.

5. The apparatus is so arranged that an excess of ink cannot blot the paper, nor soil the machinery. The reservoir is of sufficient capacity to hold a large supply of ink, and when needed may be filled without inconvenience or loss of time.

These advantages are so apparent, that the improved polarized ink-writer is rapidly superseding the older forms in all parts of Europe, Asia, and South America. Large numbers of them are employed on the government telegraph lines in England and India; although of late years there seems to be a tendency in the last named countries to introduce the system of sound reading which has proved so successful in America.

#### REMARKABLE ELECTRIC PHENOMENA.

The night of July 7-8, 1875, will be long remembered in Switzerland for thunderstorms, several of them of almost unexampled severity. Of these, one that broke over Geneva was unprecedentedly severe and disastrous. It appears to have originated to westward, in the department of Ain, and took an easterly course up the valley of the Rhone to Geneva, on reaching which it spread over a wider area, and thence directed its course over Savoy. As midnight came on, though the heat was suffocating and not a breath of wind stirred below on the streets, light objects on the roofs of the houses began to be whirled about and carried off as by a tempest of wind. At the same time a dull, rumbling sound, resembling neither that of wind nor that of thunder, announced the approach of the thunderstorm, and at 12 midnight exactly it burst over Geneva in all its fury. An avalanche of enormous hailstones, with no traces of rain, was precipitated from the sky, and shot against opposing objects by a tempest of wind from the southwest. In a moment

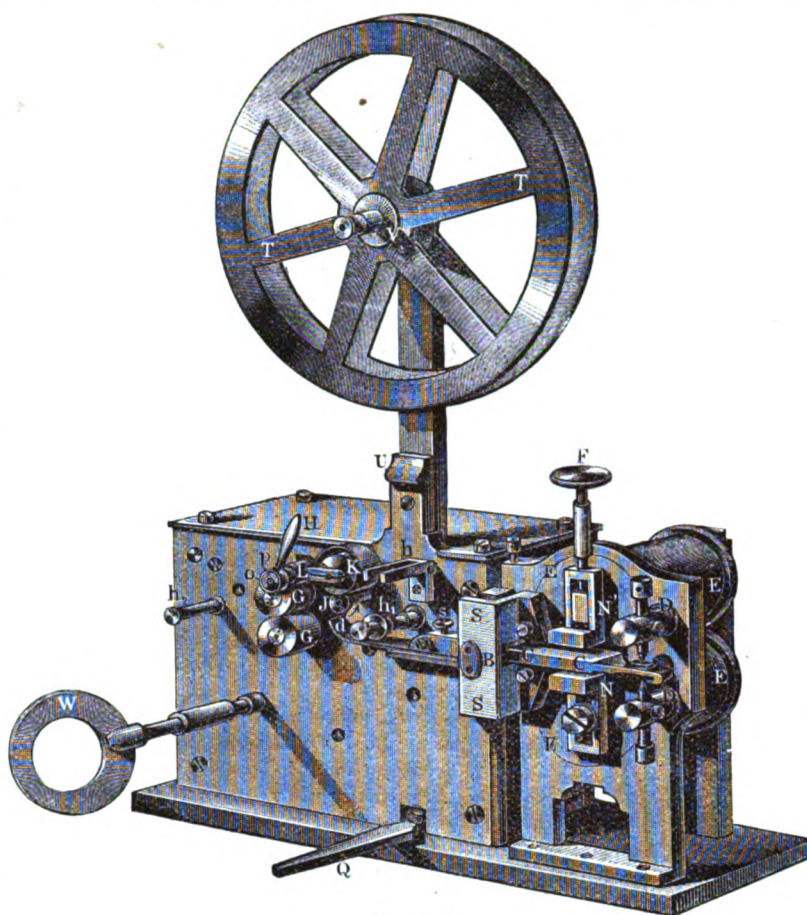


Figure 4.

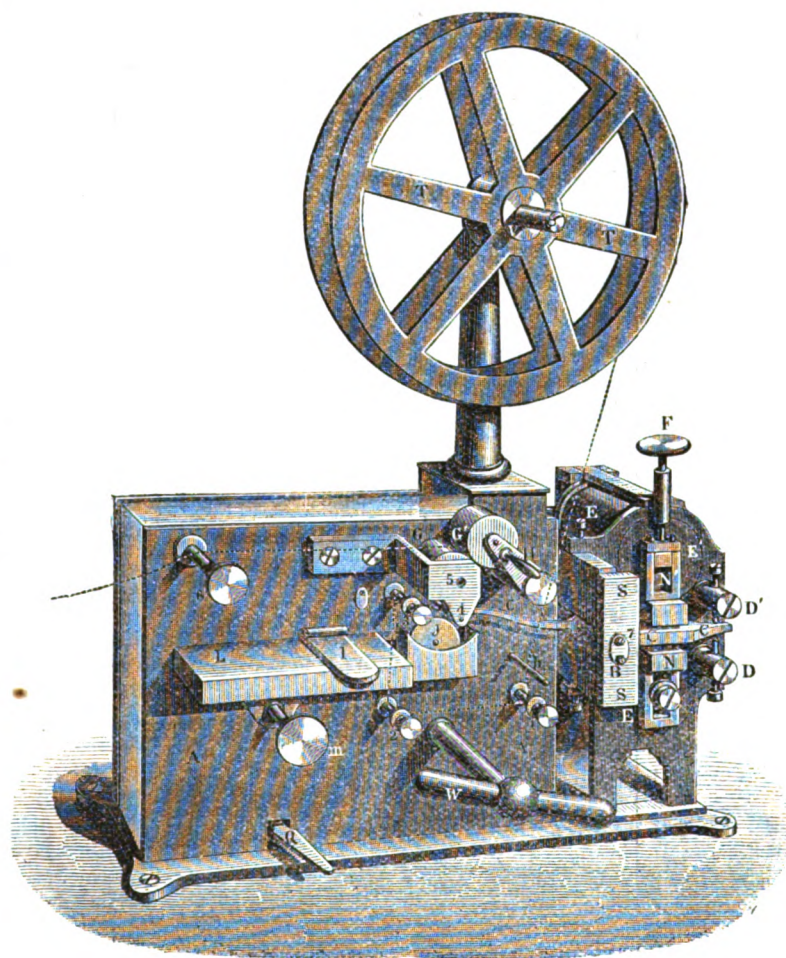


Figure 5.

the street lamps were extinguished, and in a brief interval incredible damage was inflicted, the glass and tiles of houses smashed to powder, trees stripped of their bark on the side facing the west, and crops of every sort were, in many places, all but totally destroyed. The smallest of the hailstones were the size of hazel nuts, many were as large as walnuts and chestnuts, and some even as large as a hen's egg. Some of the hailstones measured four inches in diameter, and six hours after they fell weighed upward of 10 ozs. For the most part the hailstones were of flattish or lenticular form, with a central nucleus of 0.16 to 0.40 inch diameter, developed in several concentric layers of ice, generally from 6 to 8, alternately transparent and opaque. A map has been printed in the *Journal de Geneve*, showing the districts where the storm was felt as well as the degree of its intensity in each locality. The electrical phenomena were very remarkable; the flashes of lightning succeeded each other with such rapidity, from midnight till a few minutes after 1 o'clock in the morning, that a mean of from 2 to 3 were counted each second, or from 8,600 to 10,000 per hour. Electrical phosphorescence was remarkably intense before and during the hail. The ground, animals, prominent objects, as well as the hailstones, were strongly phosphorescent. Immediately after the hail, ozone was greatly developed, the smell being so pronounced as to be compared, by nearly all observers, to garlic. The incessant electrical discharges passed from cloud to cloud over a central point from which the hail fell, but thunder was very rarely heard. — *Nature*.

#### FISHING WITH THE ELECTRIC LIGHT.

In the Paris International Maritime Exhibition there is a small object deserving of notice. It is a platinum wire placed in a bottle and ignited by electricity from a bichromate battery. It is intended to be immersed in the sea, and the light emanating from it is said to attract an immense number of fishes. Experiments have been tried lately on the coast of the Cotes du Nord Department with a fishing boat, and have proved very satisfactory, on a bank of sardines. The glass must be green or black, otherwise the fish are frightened by the glare, and do not follow the submarine light.

The military telegraph line connecting Fort Clark, Fort Concho and San Antonio, Texas, has been completed, and is working.



# NOTES OF A COURSE OF SEVEN LECTURES ON ELECTRICITY.

BY PROFESSOR TYNDALL, LL.D., F.R.S.

(Continued from page 308.)

[From the Telegraphic Journal.]

## NOTES OF LECTURE VII.

1. Lord Mahon in 1789 first observed and thoroughly investigated the "return shock." Within twenty inches of the prime conductor of his machine, he placed a second insulated conductor, and within one-tenth of an inch of the latter, a third conductor. When the machine was worked a thin stream of purple sparks passed over this small interval. On stopping the machine and discharging the prime conductor, a single brilliant spark filled the space between the second and third conductors.

2. The principles already established furnish the explanation here. By the prime conductor (charged positively) the second conductor was acted on inductively. Its negative electricity was attracted and its positive repelled. This repelled electricity produced the thin purple sparks first observed. The second conductor is, therefore, to be figured as deprived in part of its positive electricity, its negative being held captive by the prime conductor. On discharging the latter, the natural condition was restored, the repelled electricity returning from the third conductor to the second in a single brilliant spark.

3. Lord Mahon fused metals, and produced strong physiological effects by the return shock.

4. In nature disastrous effects may be produced by the return shock. The earth's surface, and animals or men upon it, may be powerfully influenced by one end of an electrified cloud. Discharge may occur at the other end, possibly miles away. The restoration of the electric equilibrium by the return shock may be so violent as to cause death.

5. It was the action of the return shock upon a dead frog's limbs, observed it is said by his wife, in the laboratory of Professor Galvani, that led to Galvani's experiments on animal electricity; and led further to the discovery, by Volta, of the electricity which bears his name.

### *Analysis of Holtz's Electrical Machine.*

6. It has been already shown in these lectures that an insulated conductor with a point attached to it may be charged, by simply presenting the point to an electrified body. This we know to be due to the streaming of the opposite electricity from the point against the electrified body.

7. If between the electrified body (charged say negatively) and the point, a plate of glass be introduced, induction will take place as before; but the positive electricity discharged from the point will cover the surface of the glass, instead of diffusing itself over the electrified body. The conductor, in this case, will be charged negatively.

8. If the glass surface thus positively electrified be removed and presented to a second point, attached to a second insulated conductor, the negative electricity will stream from the point to neutralize the positive upon the glass. In this case the conductor, by the loss of the negative electricity through the point, will be charged positively.

9. The performance of Holtz's electrical machine is, in part, due to the action here described. The negatively electrified body is a piece of paper supported by an insulator (a stationary glass disk is employed for this purpose by Holtz). Opposite to the excited paper is placed, not a single point, but a metallic comb of points, connected with a conductor. Between the electrified paper and this comb is a glass

disk capable of rapid rotation. When the paper is excited, the opposite, or positive, electricity is drawn from the comb against the glass, the conductor associated with the comb being thus charged negatively. The positive electricity is carried on by the glass and presented to a second comb placed diametrically opposite to the first. From this second comb negative electricity streams to neutralize the positive electricity of the glass, the conductor associated with the comb being charged positively. In this way two insulated conductors, connected with the two combs, can be oppositely electrified, and when the action is sufficiently strong, discharge, in the form of sparks, will pass between the conductors.

10. But this by no means fully explains the action of Holtz's machine, and to understand the explanation considerable attention will be necessary. We will approach the subject gradually.

11. First, then, we know that natural insulators are attracted by electrified bodies. An unrubbed glass rod is attracted by a rubbed one; unrubbed sealing-wax is attracted by rubbed sealing-wax. This can only occur through induction, as already explained.

12. Again, we know that when the ordinary electrophorus is excited by friction, negative electricity covers its resinous surface.

13. What we have now to add to our knowledge is this, that the layer of negative electricity with which the electrophorus is charged acts inductively upon the electrophorus itself, driving the negative of the resin to the opposite surface, and producing a positive layer between the induced and the inducing negative. The existence of the negative electricity on both sides of the resinous cake, after one side only has been excited, may be proved by the electroscope.

14. But it is only necessary to permit the cake to rest for some minutes on a metal surface connected with the earth, or for a somewhat longer time upon a common table, to abolish the negative electricity. If the cake be then turned upside down, the positive electricity of its under surface may be shown by the electroscope.

15. A disk of vulcanized india-rubber is specially suited for the rapid execution of this experiment. Whisked on one side with a fox's brush, both sides are negative. Laid with its unwhisked surface upon a table, the electricity of that surface is immediately discharged, and, on reversal, the lower surface proves to be the positive.

16. What is true of the resin cake and the india-rubber, is true of the insulators generally. If one surface, for example, of a dry glass plate be electrified, it will act by induction on the rest of the plate, covering its opposite face with electricity like its own, and producing nearer to itself a layer of opposite electricity.

17. In such a plate, therefore, we have three layers of electricity, one of them communicated, and the two others induced.

We are now, I think, prepared for the explanation of Holtz's machine.

18. Its simple form consists of a rotating glass disk, and a fixed glass disk, on which, at the opposite ends of the same diameter, two patches of paper, provided with cardboard points, are glued. The fixed glass disk does not belong to the active part of a machine at all; it is merely employed to support the patches of paper, and to keep them insulated from each other. Out of the fixed glass disk are cut two small sectors, in which the points of cardboard freely hang.

19. Opposed to each patch of paper is placed a metal comb, the rotating disk moving between the comb and the patch of paper. Each comb is connected with an insulated brass rod bearing a knob; the two knobs being capable of being placed in contact with each other, or drawn asunder.

20. The first step towards setting the machine in action is to bring the two knobs just referred to together, and into connection with the earth. Any stray electricity lingering about the combs and knobs, which might interfere with the action of the machine, is thus got rid of.

21. Let the glass disk be set in rotation, and let an excited plate of gutta percha be brought near one of the excited patches of paper. It acts while there, not only on the paper, but on the metal comb immediately opposite. From that comb, against the rotating disk, is poured positive electricity, the brass rod and knob, associated with the comb, being the negatively electrified.

22. The electricity thus diffused by the comb over the surface of the glass is carried forward by the rotating disk; but here we have to remember the principle just laid down, namely, that by the inductive action of the electricity thus covering the disk, two other layers are evoked, one covering the opposite face of the disk and an opposite one within it.

23. That both surfaces of the rotating disk are here charged positively, can be proved by the electroscope. It is not a matter of theory only, but a matter of fact.

24. Let us, for the sake of distinction, call the surface of the disk turned towards the patches of paper, the inner surface, and the surface turned towards the combs, the outer surface of the rotating disk.

25. Imagine then the moving disk with both its surfaces covered, in the manner described, with positive electricity. The inner surface thus charged comes first in the neighborhood of the cardboard point of the second patch of paper. From that point negative electricity is poured against the inner surface, neutralizing the positive of that surface. The second patch of paper is thus electrified positively, by the action of the machine itself.

26. This is a very important point to bear in mind; for, were the charge upon the patches of paper not continually renewed, the electricity would rapidly waste itself, and all action would cease.

27. But let us follow the positive electricity of the outer surface a little farther. After passing the cardboard point on the one side, it comes opposite to the metal comb on the other. Here it is neutralized by the discharge of negative electricity from the comb; the brass rod and knob associated with the comb are thus electrified positively.

It is to be borne in mind that the body charged by a point is always furnished with the opposite electricity to that which streams from the point.

28. Let us now halt and sum up. We started from our first comb with three layers of electricity, one communicated by the comb, and the two others induced by this one. By the second cardboard point the positive induced layer was neutralized, the patch of paper associated with the cardboard point becoming, through the loss of its negative, positively electrified. A moment afterwards the positive electricity of the hinder surface was neutralized by the second comb, which poured against the surface electricity.

29. But over and above the quantity necessary for mere neutralization, the second metal comb, acted on inductively by the second patch of paper (now positive), poured out a still further amount of negative electricity against the surface of the disk. This also acted inductively upon the disk itself, as the positive layer did in the first instance. We have, as before, three layers of electricity; one (negative) communicated; two (positive and negative) induced; and besides these we have the negative electricity remaining over from the first act of electrification, and which was not neutralized by the second cardboard point or the second metal comb. It is obvious from this analysis that one-half of the rotating disk must be fur

nished on both sides, with positive, and the other half with negative electricity.

30. The glass surface, thus negatively charged passes on to the cardboard point of the first patch of paper (the point on both patches being turned to face the motion). Positive electricity streams from the point against the inner negative surface of the disk, the patch of paper being thus charged negatively. Immediately afterwards the negative electricity of the outer surface is neutralized by the comb, which, over and above this, is acted on by the negatively excited paper. In virtue of this action it charges the disk anew with positive electricity, which, with its two induced layers, passes on as before.

31. Thus the patches of paper, to whose inductive action the generation of the electricity is due, are continually charged by a portion of the electricity brought into play. The diffusion of the electricity in the air is thus made good, and in favorable weather the action may be prolonged indefinitely.

32. When the knobs associated with the two metal combs are drawn apart, the discharge passes between them in a stream of sparks. Connecting with the conductors (the brass rods and knobs aforesaid) a small Leyden jar, the jar is rapidly charged and discharged, the sparks being thus rendered long, loud, and brilliant.

33. The play of the electricity in Holtz's machine is perfectly obvious in the dark. The positive comb declares itself by beautiful streams of blue light darting from its points; while every point of the negative comb is tipped by a little star. The former is technically termed the "brush," and the latter the "glow."

34. Omitting all superfluous details and complications, but retaining every essential point, I have here sought to present in a compact, and easily comprehensible form, the theory of Holtz's machine developed by Riess in a series of papers extending from 1867 to 1874. An experimental examination of the machine, when in action, shows that the condition of all its parts corresponds with the theory here given.

REMARK:—Two rotating and two fixed disks may be employed, instead of one. The explanation is the same. A small machine, with a single rotating disk, left to us by Dr. Bence Jones, and a larger machine, the property of Mr. Wm. Spottiswood, were shown in action in the lecture. The former yielded sparks four inches long, the latter sparks full seven inches long.

35. The course concludes by connecting the electricity of friction and induction with other sources and forms of this power.

The contact of dissimilar metals produces electricity.

The contact of metals with liquids produces electricity (Volta).

A mere variation of the character of the contact of two bodies produces electricity (Zamboni, Behrens, and De Luc).

Chemical action produces a continuous flow of electricity (Voltaic electricity).

Heat, suitably applied to dissimilar metals, produces a continuous flow of electricity (thermo-electricity).

The heating and cooling of certain crystals produce electricity (pyro-electricity).

The motion of magnets, and of bodies carrying electric currents, produces electricity (magneto-electricity).

The friction of sand against a metal plate produces electricity.

The friction of condensed water-particles against a safety-valve, or, better still, against a box-wood nozzle through which steam is driven, produces electricity (Armstrong's hydro-electric machine).

These are different manifestations of one and the same power; and they are all evoked by an equivalent expenditure of some other power.

#### A FRENCH ARMY TELEGRAPH CORPS.

In my letter on the military manœuvres at Vernon, writes the Paris correspondent of the *London Standard*, I briefly alluded to the innovation of a telegraphic corps. The *Journal des Débats* publishes the following very interesting details on this new corps:

"It is in the manœuvres of the three corps that has just been inaugurated the military telegraphic service. The employees of the telegraph forming part of a corps d'armée are all called out in the field on the occasion of grand manœuvres. To whatever class they may belong they all come out, and instead of being incorporated as soldiers in the regiment, they form part of a corps of telegraphists. Two sections of telegraph lines have been attached to the Brauer division. The Inspector of Telegraphic Lines, M. Morris, formerly pupil of the Polytechnic School, and nephew of Gen. Morris, who commanded in chief the cavalry guard, is the Director General of the service. The two sections form two services, the one under the direction of Max Olife is the section of the first line, acting close to the front of the troops; the second section, called the section of the second line, under the direction of M. Freylard des Ceyeux, unites the different points of the line with the reserves and the general quarters and the military establishment situated at the rear. The commander of the division gives his orders, and all the roads of communication are kept supplied with a telegraphic line. The sections have each got two carriages and several small hand-carts, and each section can lay down several lines at the same time. The wires are worked on the Morse system. The wires are composed of five copper lines covered over with gutta-percha. The wires are thus completely isolated, and can be hung on any kind of conductors, and have nothing to fear from damp. One of these wires has been sunk in the Seine, for about one thousand yards, and works very satisfactorily. The manner in which a wire is laid down is very simple; 1,000 yards can be erected in half an hour. A single carriage suffices to carry the necessary material; six horses are yoked to this carriage, and the whole is under the command of a brigadier. Two reels are fixed at the back of the carriage, and on each reel is wound 1,000 yards of wire. When the moment comes to lay down the wire it is tested by means of a portable battery placed in the carriage. When two wires have to be united they are tied together, and the knot is covered over with gutta-percha. When one of the reels has been exhausted it is replaced by another kept ready at hand in the carriage. Before starting more wire than is actually required is placed in the carriage in case of accidents. The carriage is preceded by a telegraphist on foot, who points out the most suitable places for hanging the wire. He is followed by the chief of the sections on horseback, together with an officer in command of troops who protects the convoy, but who has no authority over the telegraphist. After these comes a cart which serves as a movable post-box. In front of this cart is placed the Morse apparatus, the desk, and a small bench, whereon sits a clerk. The principal carriage follows with the reels and all boxes containing the necessary material. A workman is continually at work paying out the wire. Another man on the lookout ahead gives the signal for the several halts; behind the carriage are several workmen armed with hooked poles or ladders in order to suspend the wires to the trees, walls, or houses along the road. In several instances the wires have been placed in the

ditches, and a wire placed right across a field of battle has been trodden down by cavalry and batteries of artillery without interfering with the transmission. Behind the men who organize the lines come the carts filled with poles and small things. The poles are made of iron, at the extremity of which is a hoop. The poles can be made two or three times as long by means of pieces of iron, which can be quickly screwed on to each other. The carriages are not strictly necessary, for on the road between Croix Saint Lenfroy and Saint Julien, a section established on the 27th of September, a line of telegraphy without the use of carriages or carts. When sufficient wire has been paid out, an office has been quickly constructed by means of a tent, table and bench. The wire can be easily taken up. The reels are maintained in the same position as in starting, and a handle winds up the wire as fast as it is unhooked by the workmen."

#### ORIGIN OF ATMOSPHERIC ELECTRICITY.

According to M. Bécquerel, solar spots, which are sometimes 16,000 leagues in extent, appear to be cavities by which hydrogen and various substances escape from the sun's photosphere. But hydrogen, which appears here to be only the result of decomposition, takes with it positive electricity, which spreads through the planetary space even to the earth's atmosphere and to the earth itself, always diminishing in intensity because of the bad conducting power of the successive denser layers of air and of the crust of the earth. That would then only be negative, as being less positive than the air. The diffusion of electricity through planetary space would be limited by the diffusion of matter, since it cannot spread in a vacuum.

That gaseous matter extends further through space than the distance which is generally assigned the earth's atmosphere will be proved by the fact that auroras, which are due to electric discharges, are produced at heights of 100,000 and 200,000 yards, where some gaseous matter must exist.

M. de la Rive agrees with M. Bécquerel as to the electrical origin of the aurora, but considers that the earth is charged with negative electricity, and is the source of the positive atmospheric electricity, the atmosphere becoming charged by the aqueous vapor rising in tropical seas. The action of the sun, he considers, is an indirect action which varies with the state of the sun's surface, as shown by the coincidence in the periods of aurora and sun spots.

In the accounts of travelers in Norway, we often read of their being enveloped in the aurora, and perceiving a strong smell of sulphur, which must be attributed to the presence of ozone. M. Paul Rollier, the aeronaut, who descended on a mountain in Norway 4,328 feet high, saw brilliant rays of aurora across a thin mist which glowed with a remarkable light. To his astonishment an incomprehensible muttering caught his ear; when this ceased he perceived a very strong smell of sulphur, almost suffocating him.—*Manual of the Natural History, Geology, and Physics of Greenland.*

#### THE VELOCITY OF TRANSMISSION OF MAGNETISM.

In order to remove all doubt as to the accuracy of the results of preceding investigators, Dr. Herwig, has sought to determine the velocity of transmission of magnetic influences by separating the various portions of his apparatus to very considerable distances; and he concludes that if the action of the terrestrial magnetism really possess a definite velocity, it must amount to at least a half a million of miles per second; or, in other words, that the terrestrial magnetic influence makes itself felt at any point of the earth's surface in less than one three-hundredth of a second.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, November 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Montevallo, Ala., reopened.  
Hereafter the "tariff for other lines" to Russellville, Ark., will be 35 and 3 from Little Rock.

Hereafter the "tariff for other lines" from Chicago, Ill., to Fort Garry, B. N. A., (given under British Columbia in tariff book) will be 175 and 12.

Big Tree's, Cala., closed.

Kellogg, Cala., closed. Messages for Kellogg are delivered by stage from Callstoga.

Nord, Cala., closed.

White's Hill, Cala., changed to Nicaseo.

Yuba City, Cala., reopened.

Hereafter the "tariff for other lines" from Hartford to Portland, Conn., will be 10 and 1.

Messages taken for the following places in Conn., are delivered by stage leaving Thompsonville, daily at 3 P. M. Charges for delivery 25 cents to each:

Somers, Scitico,  
Somersville, Hazardville.

Middle Haddam, Conn., closed. Messages for Middle Haddam are delivered by messenger from Cobalt. Charges for delivery 25 cents.

Hereafter the "tariff for other lines" to Pembina, Dakota, will be 175 and 12 from Chicago, Ill.

Claymont, Del., closed.

Mt. Clare, Ill., reopened.

Moran, Ind., closed.

Owensboro', Ky., reopened; "tariff for other lines" is 40 and 3 from Henderson.

Kennedyville, Md., closed.

Clear Spring, Md., closed. Messages for Clear Spring are mailed from Hagerstown.

The Western Union method of counting words which express amounts has been adopted by the Mexican lines. Hereafter, words expressing amounts were counted for as many words as figures were required to express them. For example: the words "one thousand" were counted as four words. They are now counted as two words.

Waltz, Mich., closed.

Wahalak, Miss., reopened.

Demarest, N. J., reopened.

Skaneateles Falls, N. Y., closed.

Dexter City, O., closed.

Clifton House, Ont., closed.

Berwick, Ont., reopened.

Winchester Springs, Ont., closed.

Jordan White Sulphur Springs, Va., closed.

## NEW OFFICES.

- \* Atkins, Ark., 33 and 3 from Little Rock.
- \* West Lynne, B. N. A., 175 and 12 from Chicago, Ill.
- \* Denver, Cala., 30 and 10 from Suisun.
- \* Bridgeport, Cala.
- \* Marshall's, Cala.
- \* Fulton, Cala.
- \* Nicaseo, Cala., (formerly White's Hill).
- \* Winters, Cala.
- \* Muscogee City, Fla., tariff same as Pensacola. Check direct.

346 Harmon, Ill.

464 California Junc., Iowa.

\* Thibodaux, La., 10 and 2 from Terrebonne.

40 Mill River, Berkshire Co., Mass.

147 Black River, Mich., P. O. Address, Alcona P. O.

\* Belmont, Mich., 25 and 2 from Grand Rapids.

260 Comstock, Mich.

118 Sutton's Bay, Mich. Check Northport.

\* Tustin, Mich., 25 and 3 from Grand Rapids.

363 Montgomery, Miss.

323 Sucarnochee, Miss.

\* Taopi, Minn., 100 and 7 from Chicago, Ill.

41 Stelton, N. J.

74 Dewitt Station, N. Y.

5 Port Williams, N. S.

\* Rockliffe, Ont.

\* Rocky Farm Ont.

- 140 Shippenville, Pa.
- \* St. Michel, Que.
- \* Wheatland, Que.
- \* Concho, (Fort Concho) Texas, 50 and 2 from Denison.
- \* McKavett, (Fort McKavett) Texas, 50 and 2 from Denison.
- \* Dale, Wis., 60 and 4 from Chicago, Ill.
- \* Dorchester, Wis., 100 and 7 " "
- \* Mannville, Wis., 75 and 5 " "
- \* Spencer, Wis., 75 and 5 " "

## OFFICES HAVING "SHEET C."

Add the following in Minn. and Wis. to your "Sheet C."

- 46 Hopkins, Minn. 25 Mannville, Wis.
- 47 Taopi, Minn. 29 Midway, Wis.
- \* Mannville, Wis. 25 Spencer, Wis.
- 15 Dale, Wis. 29 Valley Junction, Wis.

All messages of the War Department and of its offices and authorized agents will be transmitted free over "other lines" to Rio Grande City, Uvalde, Concho, (Ft. Concho), and McKavett, (Ft. McKavett), Texas.

## CUBA CABLE.

A late revision of the rates to Demarara and places south of Demarara in South America gives the following tariff from Western Union Offices:

	From W. U. Offices in United States, east of Miss. River, including St. Louis, Mo.		From W. U. Offices in United States, west of Miss. River, (except St. Louis,) and from New Brunswick and Nova Scotia.	
	Ten words.	Each additional word.	Ten words.	Each additional word.
	GOLD.	GOLD.	GOLD.	GOLD.
Demerara, . . . . .	18.50	1.75	19.50	1.85
Cayenne, S. A. . . . .	23.50	2.25	24.50	2.35
Para, S. A. . . . .	23.50	2.25	24.50	2.35
Pernambuco, S. A. . . . .	28.50	2.75	29.50	2.85
Bahia, S. A. . . . .	31.00	3.00	32.00	3.10
Rio Janeiro, S. A. . . . .	33.90	3.29	34.90	3.39
Santos, S. A. . . . .	33.90	3.29	34.90	3.39
St. Catherina, S. A. . . . .	33.90	3.29	34.90	3.39
Rio Grande do Sul. . . . .	33.90	3.29	34.90	3.39
Montevideo, S. A. . . . .	33.90	3.29	34.90	3.39

For tariff to the city of Buenos Ayres and Valparaiso, add the following to the rate to Montevideo.

	For twenty words or less.	Each additional word or fraction thereof
City of Buenos Ayres. . . . .	\$2.16	\$1.08
Valparaiso . . . . .	14.66	7.33

## ATLANTIC CABLE.

We are notified that the continental rate from London to Spain "via Santander" will hereafter be \$1.75.

WILLIAM ORTON,  
President.

## TRANSFER SERVICE.

EXECUTIVE OFFICE,  
New York, October 28, 1875.

To all Transfer Agents:

On November 8th, money order offices will be established at the following named points.

In J. F. Wallick's district.

Cambridge City, Ind.

Marion, Ind.

In J. J. S. Wilson's District.

LaSalle, Ill.

ALONZO B. CORNELL,  
Vice-President.

## BORN.

GALVANI—At BYRON, Miss., Sept. 14, 1875, a daughter to Charles Galvani, manager W. U. Tel. office.

## MARRIED.

PARKS—GIBBS.—At the residence of the bride's parents, by Rev. J. H. Stribling, Theodore W. Parks, manager W. U. Tel. office, Tyler, Tex., to Miss Cora Gibbs, of Tyler.

SCHUSTER—STEEL.—On Thursday, September 23, 1875, at the residence of the bride's parents, at Fetterman, W. Va., by the Rev. Mr. Flanagan, Columbus C. Schuster, of the Gold and Stock Tel. Co., Cotton Exchange, N. Y. City, to Anna E. Steel.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

NEW YORK, October 26, 1875.

## ASSESSMENT No. 79.

25, 29, 38, 52, 54, 65, 67, 72, 80, 89, 95, 121, 141, 142, 143, 144, 146, 172, 176, 177, 183, 184, 185, 186, 187, 189, 190, 191, 193, 197, 198, 201, 202, 215, 220, 235, 247, 254, 267, 276, 286, 302, 342, 346, 349, 351, 367, 378, 379, 380, 383, 392, 393, 394, 416, 426, 431, 467, 476, 526, 532, 549, 552, 554, 576, 586, 587, 592, 603, 604, 605, 661, 671, 685, 695, 697, 705, 721, 729, 734, 735, 750, 751, 756, 808, 815, 831, 855, 858, 874, 880, 883, 896, 908, 916, 932, 978, 998, 1001, 1013, 1023, 1039, 1047, 1054, 1071, 1074, 1076, 1081, 1088, 1090, 1147, 1148, 1155, 1157, 1182, 1196, 1225, 1226, 1232, 1276, 1295, 1304, 1329, 1358, 1364, 1365, 1385, 1390, 1391, 1400, 1402, 1403, 1404, 1410, 1417, 1440, 1444, 1454, 1455, 1456, 1484, 1492, 1505, 1506, 1507, 1508, 1518, 1522, 1534, 1555, 1556, 1557, 1568, 1569, 1570, 1582, 1589, 1593, 1594, 1629, 1630, 1656, 1670, 1707, 1708, 1721, 1723, 1739, 1755, 1756, 1773, 1775, 1791, 1810, 1811, 1812, 1815, 1847, 1869, 1881, 1916, 1919, 1934, 1942, 1945, 1947, 1950, 1965, 1972, 1987, 2019, 2021, 2024, 2025, 2029, 2044, 2055, 2057, 2091, 2113, 2114, 2138, 2143, 2151, 2154, 2162, 2172, 2180, 2181, 2200, 2201, 2202, 2204, 2205, 2206, 2212, 2213, 2214, 2216, 2236, 2241, 2242, 2243, 2257, 2265, 2269, 2274, 2279, 2281, 2282, 2283, 2289, 2295, 2296, 2297, 2298, 2299, 2305, 2310, 2313, 2314, 2316, 2317, 2318, 2321, 2330, 2331, 2333, 2334, 2335, 2336, 2337, 2344, 2348, 2354, 2355, 2356, 2358, 2367, 2372, 2373, 2374, 2375, 2378, 2379, 2385, 2388, 2392, 2393, 2403, 2431, 2434, 2438, 2439, 2441, 2445, 2448, 2451, 2453, 2465, 2467, 2472, 2474, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507.

## ASSESSMENT No. 78.

39, 84, 148, 171, 206, 228, 248, 252, 280, 316, 344, 350, 361, 441, 482, 556, 557, 569, 701, 710, 722, 733, 781, 783, 786, 802, 809, 825, 836, 838, 842, 873, 904, 906, 926, 944, 980, 1000, 1002, 1014, 1016, 1041, 1057, 1069, 1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119, 1120, 1122, 1123, 1125, 1131, 1141, 1142, 1143, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 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1925, 1926, 1927, 1928, 1929,

## THE ANGLO-AMERICAN COMPANY.

The half-yearly meeting of the Anglo-American Telegraph Company was held at the London Tavern, in London, October 1st.

The report states that the total receipts from the 1st of January to the 30th of June, 1875, including a balance of £3,683 carried over from the last account, amounted to £288,637. The total expenses of the half year, including income tax, repair to cable, and depreciation of cable stock, amount to £47,570. One quarterly dividend at the rate of 5 per cent. per annum, free of income tax, was paid on the 1st of May, 1875, absorbing £87,500, leaving a balance of £153,556, from which a second quarterly dividend at the same rate of 5 per cent. per annum, amounting to £87,500, was paid on the 1st of August, 1875, leaving a balance of \$66,066 (including £32,301 surplus cable) to be carried forward to the next account. The falling off in the traffic receipts for the first six months in 1875, as compared with the corresponding period in 1874, amounting to £67,720, is to be attributed partly to the continued depression of the American trade, but chiefly to the reduction of the tariff to 2s. per word, which came into operation on 1st of May, 1875. This reduction, announced in the last report of the directors, and unanimously approved by the proprietors at their meeting in April, resulted in a considerable diminution of the receipts. The hopes which were entertained by many that low rates would produce remunerative results have not been realized, for, although a large increase in the number of messages was obtained, the experiment, so far, seems to show, on the contrary, that a low tariff cannot produce a reasonable dividend. The competing company, which opened its cable for public business on the 15th of September, announced a tariff which necessitated a still further reduction, and a rate of 1s. per word was adopted, as being the most simple and convenient under the circumstances. The result, as at present ascertained, confirms the opinions expressed in the last paragraph. Four of the company's cables are in complete working order and condition, and the messages, although greatly increased in number, continue to be transmitted with punctuality and accuracy. The directors regret to have to announce the resignation of his seat at the board of Mr. E. J. Halsey, a gentleman who has always shown great zeal and activity in the interests of the company.

The chairman, Lord Monck, in moving the adoption of the report, referring to the reduction of the tariff first to 2s. and afterwards to 1s., and the competition with the Direct Cable Company, said:

"He hoped they would not imagine that he spoke with the slightest feeling with respect to this question of competition, for he could assure them there was nothing further from his mind, as he looked upon the matter not as a question of feeling, but as one of *£ s. d.* What he meant to say was this, that he knew there was some gentlemen among the Direct Cable shareholders, and a very large portion of the community at large, who thought a low tariff would bring them such an accession of business as would enable them to pay a good dividend, whereas with the 4s. tariff they were not making anything worth talking of. His own opinion never ran in that direction, but still the board felt bound to show these gentlemen that a 1s. tariff would neither pay them nor the Anglo-American Company itself. The result of the company's experience was to show that before they could recoup themselves what they lost by a reduction of the rate, they must have such an increase in the number of messages as would virtually clog with traffic the four cables belonging to the company. That was a thing to be

avoided, inasmuch as the slightest disarrangement was calculated to damage not only the traffic but the company in respect to its efficiency. That was a lesson worthy to be laid to heart. The directors have proved that neither the company nor its competitors can make a profit on the 1s. tariff, even when working at high pressure.

If those who were connected with the Direct Company were possessed of common sense, as they were undoubtedly possessed of great common sense, they must admit that a low tariff will not pay them. They had too, he hoped, satisfied the public that they should not expect that the company should do business for them at a loss. Having arrived at this conclusion, they felt when the direct cable was broken, and the reins were again in their own hands, that they were bound to return to the 4s. tariff which had given them a good income in the past, and which would give them the same in the future. He wished now to say a word with respect to the interest of the public in this matter of long sea cables. They had heard a great deal about fresh and fresh competition, and when the Anglo-American board adopted the shilling tariff he met a gentleman who said to him, 'You are going to crush the Direct Cable Company, and that is a generous policy.' But he could assure the meeting that the directors did not entertain any such views, nor was it possible they could, inasmuch as the smallest traffic would be sufficient to enable them to go on paying their working expenses."

The chairman further stated, in reply to questions in regard to the current rumors in regard to the negotiations between the directors of the two companies, that "He had heard of rumors of negotiations between this and the other company, but he had not heard anything about negotiations."

A shareholder inquired whether the directors intended to again reduce the tariff in the event of the new competition on the part of the Direct Cable being revived.

The Chairman: "Certainly not."

After some further discussion the ordinary routine business was disposed of, and the proceedings terminated in the usual manner.

## THE BRAZILIAN SUBMARINE TELEGRAPH COMPANY.

The announcement made this week by the Brazilian Submarine Telegraph Company, that the accounts although not fully audited, show a profit for the year ended on the 30th of June, sufficient to enable the directors to recommend a final dividend of 2s. 6d. per share, to be paid on the 28th inst., making with the three previous quarterly distributions, five per cent. per annum, and to carry to a reserve fund as much as £40,000, will no doubt be encouraging to the proprietors, seeing that the accounts, now shortly to be issued, will complete the first financial year of the company, the cables having been opened for traffic on the 23d of June last year. The directors are to be commended for their determination to carry so large a sum as £40,000 out of profits of the year to the formation of a reserve fund. The amount is equal to a further profit of three per cent. on the capital of the company; but it is of great importance, in the permanent interest of the proprietors in cable companies, that large reserves should be established—and the above sum, together with the surplus cable, valued at £21,687, which remains in hand, makes a very substantial beginning in this respect for the Brazilian Submarine Telegraph Company. This company has the very exceptional privilege of being the only deep-sea trunk line which is absolutely secured against premature competition. Its conces-

sions, granted by the Emperor of Brazil and the King of Portugal, are exclusive, and extend for twenty years, and give it the right of working in perpetuity. These are most important considerations, seeing what have been the effects of threatened competition to other telegraphic companies. Its cables are laid in three sections, viz., from Lisbon to Madeira, Madeira to St. Vincente, and St. Vincente to Pernambuco. There are stations at each place, and that at Madeira has a fair amount of business connected with the shipping and commerce between Europe and the Cape. It must be also remembered that, although this company has not duplicate cables, its position is well protected by special working agreements with other companies. For instance, the Western and Brazilian Telegraph Company, which possess a monopoly for forty years of the cable traffic on the coast of Brazil from Rio Grande de Sul in the south to Para in the north, exchanges one-third of its gross receipts with the Brazilian Submarine Company. The former has a large local traffic, is associated with the other lines in South America, and, of course, all the through traffic from the River Plate, together with that just opened from Lima on the west coast, passes over its lines; and even should a temporary interruption occur on one of the sections of the Brazilian Submarine line, the Western and Brazilian would lose no traffic, as it then would forward its European messages via the West India and Panama and the Atlantic lines. Such a mutual arrangement as this, of exchanging a proportion of the receipts, would largely compensate for the partial loss of revenue during any possible interruption on the Brazilian Submarine Cable. This company has also working arrangements with the Eastern Telegraph Company and the West India and Panama Telegraph Company, and it receives one-fifth of the net earnings of the cable between Para and Demerara.

It will thus be seen that the company occupies a strong position among cable companies, and, in the present dearth of first class securities yielding a large return, its shares are not unworthy of notice. Some cable properties have been subjected of late to violent oscillations in prices, but these have been almost entirely due to speculative action arising from the prospects of competition—a contingency not affecting the Brazilian Submarine Company. Experience has so far shown that cables well laid and well manufactured in the first instance improves by age, especially such as have been laid where the ocean currents are comparatively unimportant, as in the case with those of the Brazilian line, and the investing public will, no doubt, ere very long, begin to show that the fact has been duly appreciated.—*The Railway News.*

The number of messages by the Cuba Submarine Telegraph during the month of September was 2,072, estimated to produce £2,000, against 1,797 messages, producing £1,802, in the corresponding month of last year.

The traffic receipts of the Great Northern Telegraph, for the month of September last, were 392,089fr., and for the same month last year, 425,931fr. Total traffic receipts from January 1 to 30th of September last, 2,186,948fr. (£127,478), and for the corresponding period last year to 3,328,040fr. (£133,122).

The traffic receipts of the Eastern Telegraph, for the month of September last, £30,176, against £28,208 for the corresponding month of 1874.

The traffic receipts of the Eastern Extension, Australasia, and China Telegraph, for the month of September last, £18,080, and for the corresponding period of 1874, £18,163.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

### TWO DOLLARS PER ANNUM IN ADVANCE.

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, NOVEMBER 1, 1875.

### DEATH OF PROFESSOR WHEATSTONE.

In the death of Sir Charles Wheatstone, which recently occurred in Paris, the world has sustained a grave loss and a vacancy has been created in scientific circles which will be widely felt.

Professor Wheatstone, as a scientific man and as an inventor, had obtained a world-wide celebrity. He was among the first to turn his attention to the phenomena of electricity, and to the investigation of the laws which govern its action, and to this department of science he devoted the greater part of his labors during the latter half of his long and useful life.

The invention of the electric telegraph has been claimed for him, but without just grounds. He, in conjunction with Mr. Cooke, certainly patented a complete system, so far as it went, the details of which were made public prior to that of Morse, but he, himself, was ante-dated by others, and all were superseded by Morse, to whom, it is now undisputed, belongs the credit of bringing forth the first practical working system of electric telegraph.

As an electrician and telegraphic inventor, Wheatstone possessed unsurpassed ability. His genius was versatile and from it he reaped a high reward. He went down to the grave covered with the honors of science, and his name will long live as one of the most efficient aiders in the onward progress of the human race.

The cable steamer *Faraday* is reported to be on her way from England to repair that unlucky Direct United States Cable. It would seem that the management of this last trouble is even worse than the previous mismanagement to which we have heretofore alluded. It is hard to understand why it should be necessary to wait a month or six weeks and to send a vessel twenty-five hundred miles to repair a break within less than fifteen miles from land, when vessels capable of performing the work could be had at Halifax or St. Johns and the job have been completed within a week and at a tithe of the expense.

### THE TELEGRAPHER'S MUTUAL BENEVOLENT ASSOCIATION.

The annual meeting of this worthy institution occurs on Wednesday, November 10, 1875, on which occasion it is hoped a large delegation from distant cities, in addition to the presence of the local membership, will be in attendance.

The Association has now been in existence eight years, and the present anniversary finds it in a prosperous and promising condition. It has never attained the large membership which some expected of it when first inaugurated, but its membership was never so solid and reliable as now. Its present number is 1,250, an increase of over 50 during the past year. This has been caused partly by the generous course taken in the arrangements for the restoration of members who by misfortune or by inability, and even through neglect, had allowed their membership to become forfeited. It has also established an amount of solid interest in the organization which will secure its continued usefulness and permanency. During its existence it has provided for 79 families, and thus mitigated a vast amount of suffering by one of the easiest and most inexpensive of agencies.

There have been only eight deaths during the past year, two of which were caused by accidents. This is a new experience, and indicates either an exceptional state of the public health or great care in the recommendations to membership. This is cause for congratulation. We are informed, also, that after all claims shall have been fully paid, two of these not having yet matured, there will be a surplus fund in the Treasurer's hands of \$7,000. With another year of careful administration the contemplated surplus fund of \$10,000 will, no doubt be fully attained.

We again heartily commend the Association to the craft every where, and sincerely rejoice in its success. We think it could bear an increase of a few hundred more to its membership, although in this, as in many other things, it is well to make haste slowly. With a careful and just administration we have no doubt it will in time fully accomplish its useful and honorable mission by a membership as wide as its best friends can desire.

The following is the statement of the Treasurer, to be presented at the meeting:

New York, Oct. 22, 1875.

From November 11, 1874 to date.		
Cash Nov. 11, 1874.....	\$9,515 95	
Received assessments.....	12,417 16	
" applications.....	165 00	
" interest on investments.....	175 00	
Gift W. U. T. Co.....	1,000 00	
Sale of desk.....	15 00	
<b>Total.....</b>	<b>23,288 11</b>	<b>23,288 11</b>
<hr/>		
Paid to heirs.....	\$13,450 00	
Paid for printing.....	204 35	
Paid for postage.....	161 76	
Refunded.....	13 50	
Salary.....	458 26	
Due on 78 and 79.....	2,000 00	
<b>Total.....</b>	<b>16,287 87</b>	<b>16,287 87</b>
<b>Reserve.....</b>	<b>7,000 24</b>	
<hr/>		
Assessments called for.....		10
Number of deaths.....		8
Number of members.....		1250

### AN IMPORTANT DUTY.

One of the duties (and it is not the least important) appertaining to the position of manager of an office is to see that operators working circuits under his direction are acquainted with the regulations of the Company concerning that service. Operators at terminal points, particularly in the larger offices, are apt, in their ignorance, to act arbitrarily in imposing their ideas as to the proper transaction of business upon offices which have either to violate explicit directions in conforming to these views or suffer the consequences in delayed business and the creation of unnecessary correspondence. Above all it is important that every operator should understand the provisions contained in rule 20 of the Book of Regulations; and, understanding, be governed thereby. The rule reads:

"In order to prevent delay in the transmission of messages, arising from differences of opinion as to their proper route or mode of counting, the sending office will select the wire over which its business shall be sent, and decide as to the number of words contained in the names of places and things, or in compound words. No office shall refuse to receive and forward or deliver any message from any other office, unless it should endanger life or property, in which case the receiving office will hold such message until advised by the District Superintendent. If any message is improperly sent or counted, the manager of the receiving office will immediately notify the District Superintendent."

These remarks are called forth by a communication received from a correspondent on Long Island. The character of the complaint is not singular—we have heretofore received many such, and have in each case pointed out the proper course to be pursued. He asks the number of words contained in the following:

"Please have a coach at Hunter's Point depot at six o'clock this evening."

It was correctly checked 13 words, but the receiving operator refused to pass it unless the check was made 12, counting "Hunter's Point" one word, and to avoid delay and wrangling this was done. In this case the sender acted discreetly in protecting the Company's interest from the delay threatened, but such cases should not arise, nor would they, probably, if operators were familiar with the regulations governing the service in which they labor.

### A MEMORIAL VOLUME.

An elegant memorial volume in honor of the late Vice-President Mumford has just been completed by Mr. G. A. Stimpson, draughtsman in the electrician's department of the Western Union Telegraph Company. The book is composed of sixty-nine pages, and is written in the highest style of the art of penmanship, both plain and ornamental. It is embellished with a portrait of the deceased gentleman, also the crest of his family, and also a finely executed vignette of the Western Union building in this city. The volume contains the resolutions of the Executive Committee, and the Board of Directors of the Western Union Telegraph Company, and the Board of Directors of the International Ocean Company, together with the



proceedings and resolutions of the late meeting of the friends and associates of Mr. Mumford.

Viewed from an artistic stand-point, anything more beautiful than this book could hardly be imagined, and the artist is deserving of much credit for his pains-taking and conscientious labor. The book is to be copied and the two are to be presented respectively to the widow and the mother of Mr. Mumford, by his late associates, as a token of the esteem in which he was held both personally and officially.

A few copies of the work are to be reproduced by the photo-lithographic process for distribution among the friends of Mr. Mumford outside of the family circle.

#### OBITUARY.

##### MAJOR MARK HOLLIS PRESCOTT.

Major Mark Hollis Prescott died in Ottawa, Illinois, Sunday, October 10th, 1875, after a brief illness, of paralysis of the heart.

Major Prescott was the youngest son of Mark H. Prescott, Esq., of Ottawa, Illinois, and was born in Kingston, N. H., March, 1836. In early life he was engaged in the telegraph business, and at one time had charge of the telegraph office at Brunswick, Me. He was subsequently engaged in mercantile business in the West, and at the breaking out of the rebellion enlisted as private in Battery A, Ottawa Light Artillery, of Illinois Volunteers, which was sent at once to Cairo, Ill., in April, 1861, to defend that important post, which was surrounded by secessionists and menaced by a superior force of armed rebels. His Company was the first to plant itself upon the levee. Mr. Prescott was promoted to be Orderly Sergeant July 31, 1861. Having served the three months for which they enlisted, and the Company being mustered out of service, Mr. Prescott volunteered for the war, and was commissioned as first Lieutenant of Battery C, First Regiment Illinois Artillery, stationed at Bird's Point, Mo., opposite Cairo, Ill., and participated in several skirmishes with distinction. In February, 1862, his Company formed a part of Grant's expedition up the Tennessee river, and expected to participate in the capture of Fort Henry, which occurred February 6, but was prevented by the bad state of the roads from reaching the place until its surrender to the fleet of gunboats under the command of Com. Andrew H. Foote. The Company was then ordered to Island No. 10, in the Mississippi river, arriving at New Madrid, Mo., in March, where a severe and bloody battle occurred, and where Lieut. Prescott distinguished himself in the action which resulted in the capture of the place. In January, 1863, he was promoted to be Captain of the same Company, and subsequently fought in sixty battles, among which were, in addition to the above, Millikens' Bend, on the Mississippi, Farmington, Corinth, and Booneville, Miss.; Stone River, Chickamauga, Lookout Mountain, Missionary Ridge, Buzzard's Roost, Resaca, Pumpkinvine Cross, Ga., Jonesboro, Ga., and Atlanta, throwing the first shot into the city. During the Atlanta campaign of five months, Captain Prescott, with his battery, was in action and under fire every day but twelve. In November, 1864, he was promoted to be Major of the First Regiment, Illinois Artillery. He was soon afterwards ordered to Chattanooga, and placed on duty under Gen. Brannon, Inspector General of Artillery. Having all the while been at the front and in active duty, Major Prescott soon became dissatisfied with such inactive life, and on

the 27th of November, 1864, he resigned, and was honorably discharged from the service. He had seen much hard service, performed his duty satisfactorily, and with honor to himself and country. He was wounded three several times, neither of which proved very severe.

As a soldier Major Prescott was brave and efficient; as a business man, quick and intelligent; and socially, genial and popular. He leaves a wife and three children, and a large circle of relatives and friends to mourn his sudden death.

##### SIR CHARLES WHEATSTONE.

The death, in Paris, on Tuesday, October 19th, of Sir Charles Wheatstone, is announced by cable. Prof. Wheatstone was born at Gloucester, England, in 1802, and was consequently in his 74th year at the time of his death. In many respects he was a most remarkable man. He possessed great inventive talent, which was mainly directed in the paths of electrical science. In early life his studies were principally devoted to the analogy existing between light and sound, and he produced numerous models and apparatus to illustrate these phenomena. Few men have done so much toward enabling the student to apprehend the principles on which scientific theories are based, particularly those of the undulatory theory of light. In 1823 he published a paper entitled *New Experiments on Sound*, and, ten years later, his first paper *On Acoustic Figures*, was communicated to the Royal Society, followed, in 1834, by *Experiments to Measure the Velocity of Electricity*, in which, with a mirror revolving eight hundred times in a second, he demonstrated the velocity at 288,000 miles in a second—greater than that of light. In the same year he was appointed Professor of Natural Philosophy in Kings College, London. About this time, by his acquaintance with William Fothergill Cooke, his knowledge in the science of electricity became available in the direction of the electric telegraph, and in 1837, they took out a joint patent for "improvements in giving signals and sounding alarms in distant places by means of electric currents transmitted through metallic circuits." This apparatus had five needles as indicators and required five wires in its operation. It was afterwards simplified and in its best form came into general use in Europe. It has since been almost entirely superseded by the inventions of Morse and Hughes. In 1840, he showed that by means of electro-magnetism, a number of clocks far apart might be kept going with absolute exactitude from one central clock, and in 1843, he brought out new instruments and processes for determining the constants of a voltaic series. In 1840, and again in 1843, he was awarded the medal of the Royal Society—a high acknowledgment. Subsequently he brought out numerous scientific and ingenious inventions which heightened his reputation and also procured him substantial pecuniary reward. Many of his inventions have been described in these columns. Among the most important are his cryptograph; his automatic telegraph in two forms; his telegraph thermometer and barometer, by which an observer at the foot of a mountain could read the indications as shown by the instrument on the summit; his dial telegraph and a machine for the conversion of dynamical into electrical force without the use of permanent magnets.

Sir Charles Wheatstone was a member of all the leading scientific academies and societies of Europe, and had been Vice-President of the Royal Society. He was knighted on the occasion of the laying of the Atlantic cable, in recognition of his eminent services in the realm of science.

##### THE AMERICAN DISTRICT TELEGRAPH COMPANY.

The annual meeting of the American District Telegraph Company was held at the executive office of the company, No. 62 Broadway, New York, on Tuesday, October 12th. Forty-two thousand and eighty-eight shares were voted on, and the following gentlemen elected directors for the ensuing year: Messrs. E. W. Andrews, A. B. Cornell, Townsend Cox, A. W. Greenleaf, John N. Gamewell, H. L. Hotchkiss, Charles Lawson, A. H. Laffin, and H. T. Jenkins.

The annual report of the President, Mr. E. W. Andrews, was read, which showed the company to be in an increasingly prosperous condition, and its prospects for the future excellent. The business of the company is constantly increasing, and the ratio of cost of operating to gross receipts diminishing, as the organization of its system is such as to make it relatively less expensive to do an increased business. There has been during the past year an increase of instruments over the previous year of 793. On the 1st inst. there were in actual use 3,517 instruments, against 2,724 last year. The average increase of earnings has been 227 per cent., against an increase of expense of 103 per cent. The company operate twenty-three district offices, and experience has demonstrated that there is a steady increase of the business of a district the longer it is in operation. The increase of earnings per instrument per annum was reported as follows: 1873, \$64.66; 1874, \$73.19; 1875, \$83.18. As the public become accustomed to the use of the system and aware of its advantages and convenience, they use it more frequently, and the result is an increased average of earnings per instrument.

In addition to its system and property in this city, the company holds a large amount of stock in companies organized for its introduction elsewhere, which has been received as a royalty for the use of the patents held by the company, and which it is confidently believed will, at a not distant day, become a source of revenue from dividends and very valuable.

At a subsequent meeting of the Board of Directors the following officers were elected: E. W. Andrews, President; A. B. Cornell, 1st Vice President; J. N. Gamewell, 2d Vice President; A. W. Greenleaf, Treasurer; C. B. Hotchkiss, Assistant Treasurer and Secretary.

##### A NEW ELECTRIC MOTOR.

Mr. C. A. Hussey, of this city, has on exhibition, at the fair of the American Institute, an electric motor containing several improvements over those previously exhibited. The engine, which is quite small, is operated by five Bunsen cells, and its movements are controlled by a simple device by connecting or disconnecting a greater or less number of elements. It is driving a sewing machine making 560 stitches per minute.

##### ELECTRICAL EXHIBITION IN PARIS.

In the Champs Elysées, in July, 1876, will be held an exhibition of the applications of electricity to industrial and domestic purposes. Information will be given on application at the offices of the exhibition, 86 rue de la Victoire, Paris. A special exhibition of the improvements in railway appliances has been proposed to be opened in Paris next year.

The construction of a telegraph line between Prince Edward's Island, Magellan Island and Bird Rocks is in contemplation by the Canadian Government. The line, when completed, is expected to be of great service in saving life, and assisting shipwrecked vessels.

Here It Is.

MANAGERS, OPERATORS, MESSENGERS.

**Sisson's Improved Tidy Fasteners.**

NO FAMILY SHOULD BE WITHOUT IT.

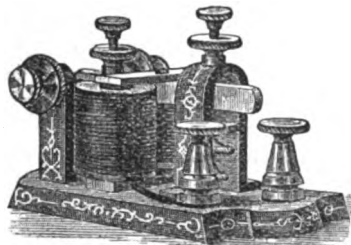
Sells rapidly. Money in it. Send 25 cents for samples.  
Gross, \$7.00. Quarter Gross, \$1.75. Agents wanted.

GEO. W. FLAGG, Newport, R. I.

THE undersigned is prepared to contract for the prompt delivery of TELEGRAPH POLES of any size and quality.

WILLIAM H. WEED,  
CONTRACTOR AND BUILDER,  
No. 111 Liberty Street, New York.**A Great Reduction in Prices.**

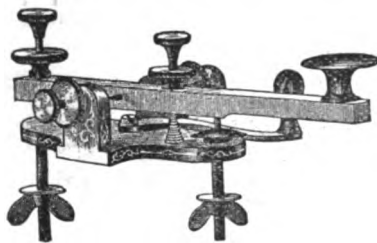
I am now making a specialty of my PHIL. SHERIDAN SOUNDER AND KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



PHIL. SHERIDAN, \$4.00.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. Extra.



PHIL. SHERIDAN KEY, PRICE, \$2.00.

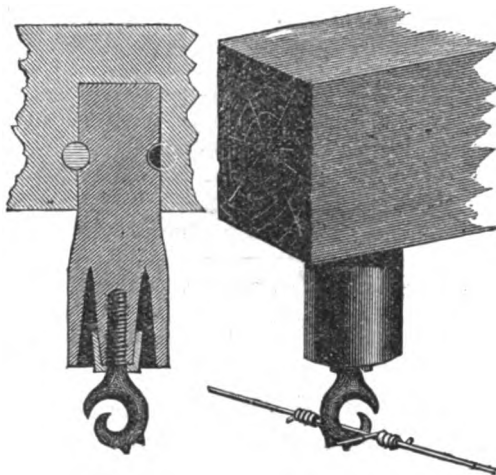
You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, etc., etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Callaud Battery, 1 lb. Blue Vitrol, Connection Wire, Book of Instruction, etc., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

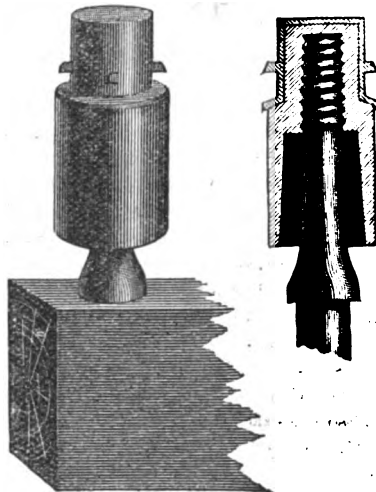
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91½ SENECA ST., Cleveland, Ohio.CALIFORNIA AGENCY  
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IMPROVED CURVED KEYS, LATEST AND BEST,  
CHAMPION LEARNERS' INSTRUMENTS,  
SPLENDID NEW POCKET RELAYS, AND  
REGULAR RELAYS.Address  
GEO. M. POMEROY, San Jose, California.**THE KENOSHA INSULATOR CO.**Telegraph Companies and Telegraph Constructors  
are invited to examine the merits of our new and improved  
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These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellent of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of Six Years' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average, MORE THAN TEN TIMES AS GREAT during the prevalence of rain or fog.

Immense numbers of these Insulators are in use by The North Western Telegraph Co., The Western Union Telegraph Co., as well as many RAILWAY and OTHER TELEGRAPH LINES, and they have invariably been found to give ENTIRE SATISFACTION.

Besides the Suspension Insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, which does not cramp or injure the line wire, we manufacture several other patterns, among which is the

**CAP INSULATOR, WITH PIN OR BRACKET,**

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**THE KENOSHA INSULATOR**

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice, CROSS-ARMS for any REQUIRED NUMBER OF WIRES, prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators. These Insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all Insulators furnished by us to prove entirely satisfactory.

THE KENOSHA INSULATOR CO.,  
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GENERAL EASTERN AGENTS.THE WESTERN ELECTRIC MFG. CO., of Chicago,  
GENERAL WESTERN AGENTS.

WANTED—BY YOUNG MAN, A FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 70, Janesville, Wis.

\$5 to \$20 per day at home. Samples worth \$1 free.  
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Electrotype Cards, of Keys, Sounders, Relays, etc., with your name, handsomely printed on 25 assorted cards, for 25 cents, or 75 with name, business, etc. for 50 cents. Also R. R. Cards, samples of Electrotype Cards 3 cents. Agents allowed 25 per cent. to take orders for the finest and largest assortment of fashionable Visiting Cards, with Circulars, etc. mailed for 25 cents.

Address,  
F. P. MUNNN,  
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This Holder is intended to save the last half or third of the pencil.

**DIRECTIONS:**

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 25 cents each. Sent by mail on receipt of price.  
Price per dozen, 2.50.GEO. H. BLISS & CO.,  
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PATENT RUBBER-COVERED WIRE,

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This is the ONLY one which which is perfectly suitable for all open circuit work such as Electric Bell ringing, hotel and house annunciators, burglar alarms, signals, laboratory experiments, etc., or wherever a battery is wanted which is clean, free from acids, always ready for use, and does not consume when not in operation.

IT LASTS, WITHOUT RENEWAL, FROM SIX MONTHS TO SEVERAL YEARS, according to use.

IT DOES NOT FREEZE, EMITS NO ODOR WHATEVER, and  
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For these reasons it is the only suitable and SAFE battery FOR BELLS, etc., in Private Houses where the Battery must be CLEAN, RELIABLE, and always ready for use.

The electro-motive power of Grove being 100, this is 75, and Daniells 50; or three cells of this battery are equal to four cells of the Daniells.

Liberal discounts to the trade. For circulars, prices, etc., send to

The LECLANCHE Battery Co.  
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AND  
POLICE TELEGRAPH.

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This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

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is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM RELIABILITY;

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The distinctive features of these systems of

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*First*—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables anyone—even a child—to give an instantaneous, general and definite alarm of fire.

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These features combined form the

ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM

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The introduction and operation of the AUTOMATIC SYSTEM involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

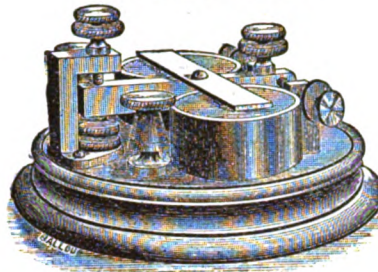
The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

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Improved.



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THE FINEST SOUNDER MADE.

THOUSANDS IN USE.

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Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful little Sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. PRICE, \$4.00.

No cast or malleable iron used in these instruments.

Sounder and Key, together. \$9.00.

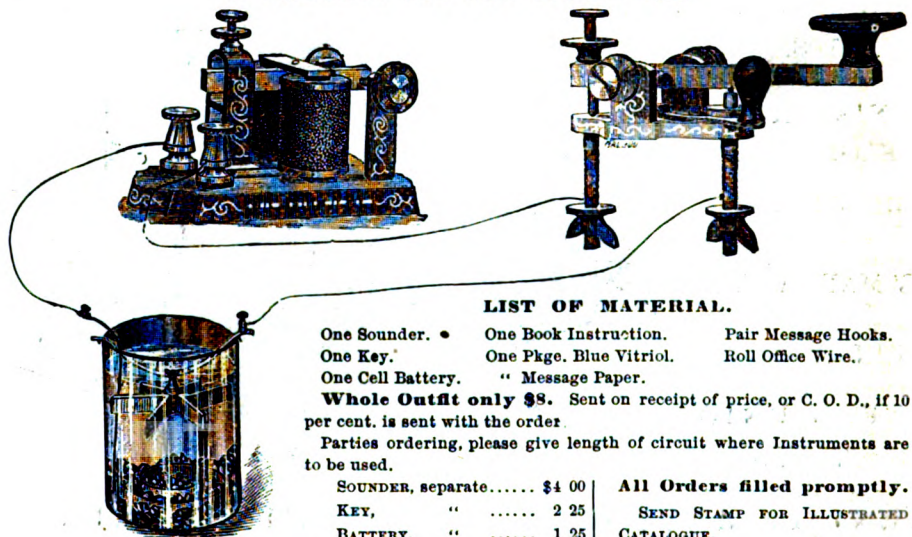
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**THE EUREKA INSTRUMENT.**

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**LIST OF MATERIAL.**

One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
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Whole Outfit only \$8. Sent on receipt of price, or C. O. D., if 10 per cent. is sent with the order.

Parties ordering, please give length of circuit where Instruments are to be used.

SOUNDER, separate.....	\$4 00	All Orders filled promptly.
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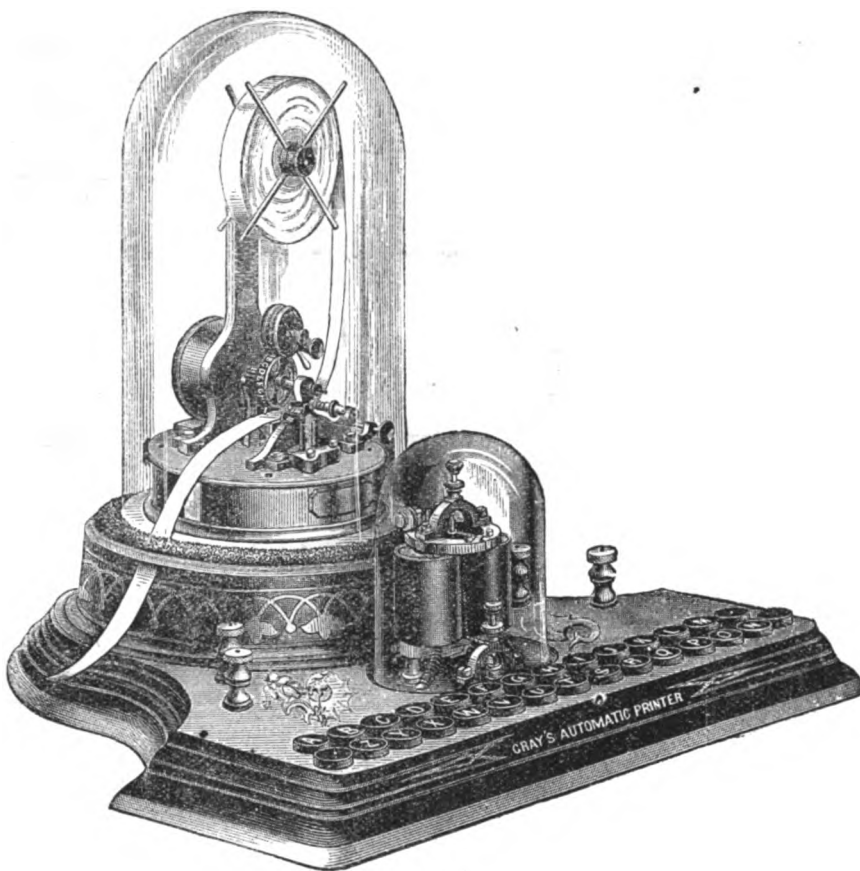
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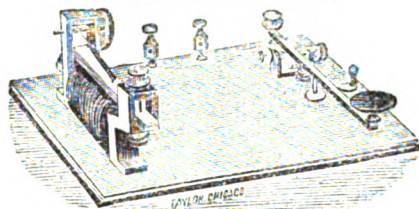
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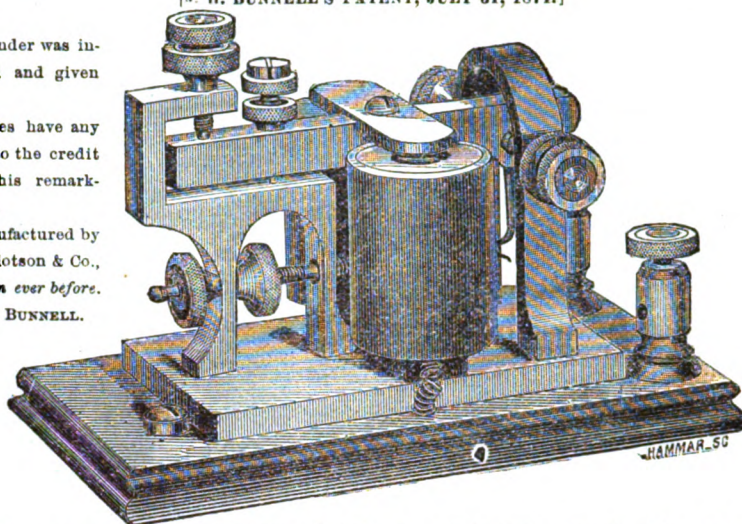
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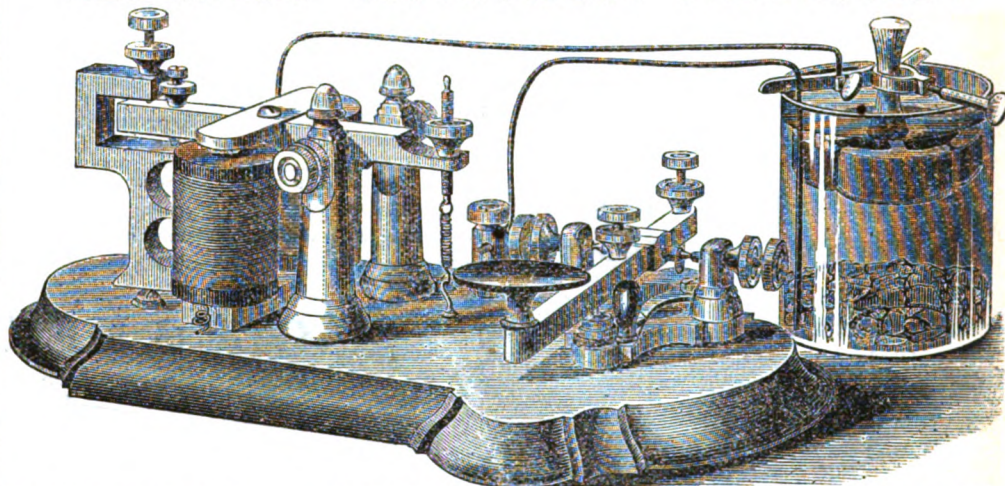
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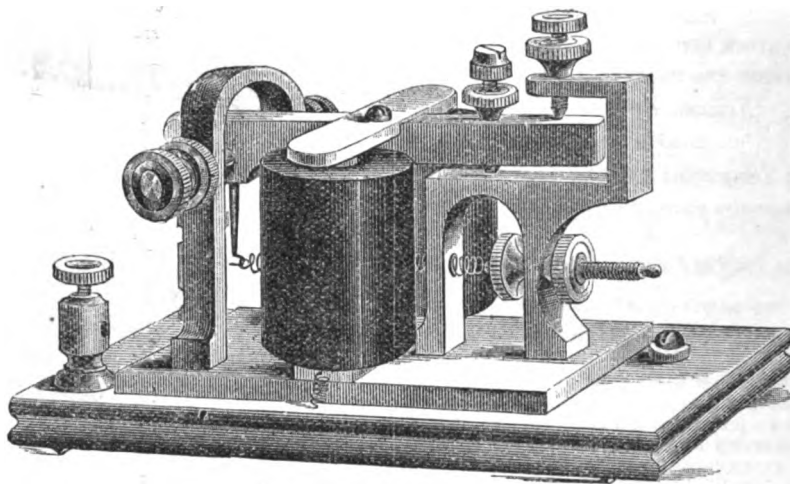
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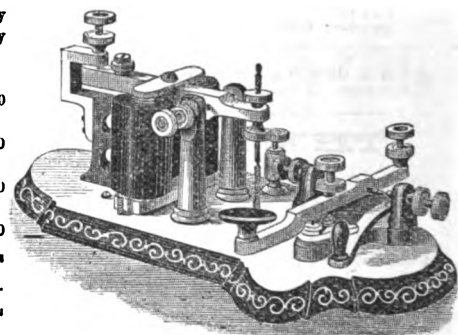
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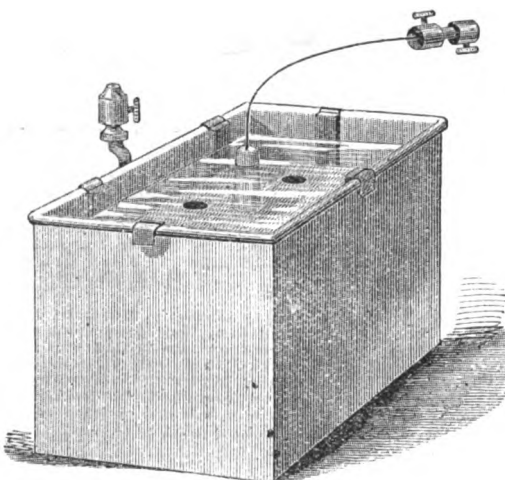
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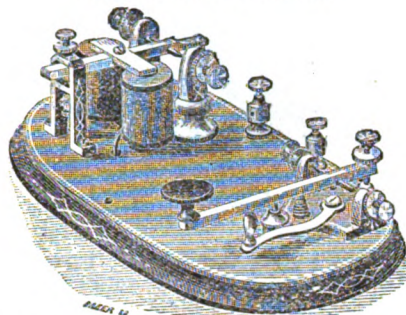


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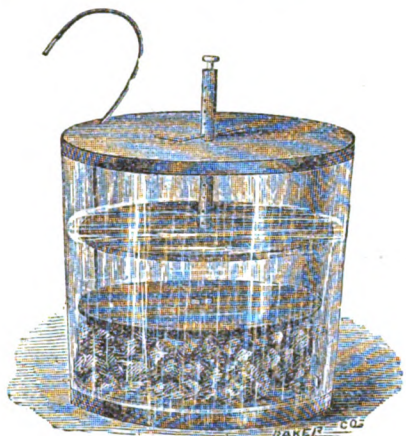
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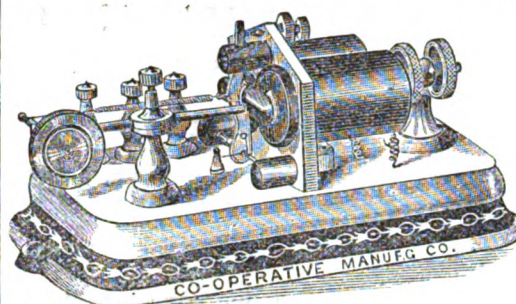
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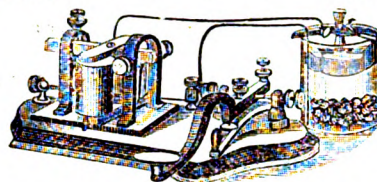
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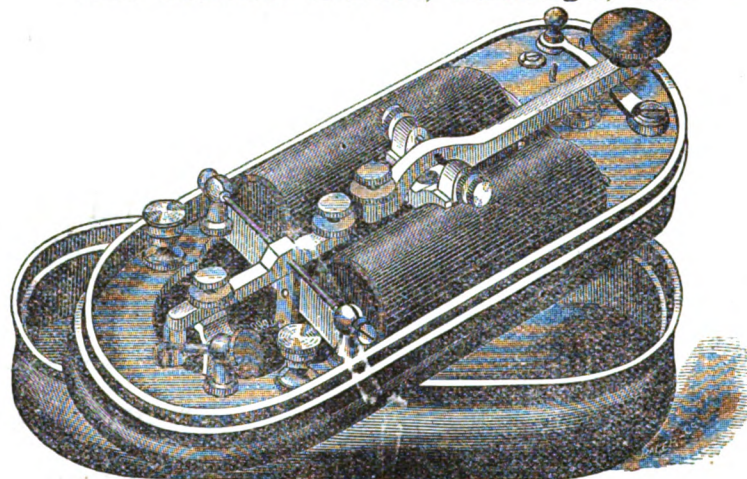
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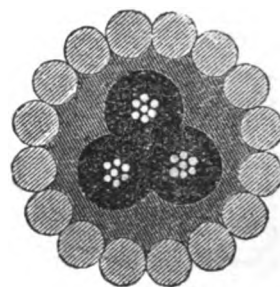
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 22.

NEW YORK, NOVEMBER 15, 1875.

WHOLE NO. 193.

## ON QUADRUPLUX TELEGRAPHY.

By F. L. POPE.

The simultaneous transmission of two telegraphic communications in opposite directions upon the same wire, now known by the name of duplex telegraphy, dates back to the year 1853. The first to conceive of its possibility, as well as the first to carry the conception into practical effect, was Dr. Wilhelm Gintl, Director of State Telegraphs in Vienna, Austria. He described his method in a paper read by him before the Vienna Academy of Sciences on the 9th of June, 1853, and in July of the same year, it was put in practical operation between Prague and Vienna.

In March of the following year, Carl Frischen, a telegraphic engineer of Hanover, Germany, improved upon Gintl's plan, by making use of a branch current from the

main battery for compensating the effect of the outgoing current upon the home relay, instead of the local current employed by Gintl. This is unquestionably the most important improvement which has been made in duplex telegraphy from the time of its original invention by Gintl, down to the time of the addition of the condenser by Stearns, in 1872. Frischen used a differential relay having helices composed of two equal and opposing wires, and an artificial or rheostat line equal in resistance to the main line, substantially as they are used at this day. His first practical experiment was made between Hanover and Gottingen on the 26th of May, 1855.

The labors of Frischen, and of Siemens and Halske of Berlin, who during the same year, independently but subsequently worked out a method almost precisely similar to Frischen's, brought the system of simultaneous transmission in opposite directions to a state of perfection which answered a very good purpose upon the comparatively short lines, and at the slow rate of transmission in vogue at that day.

The success of these ingenious inventions gave an entirely new direction to the minds of the host of enterprising electricians on the continent of Europe, and during the following year, 1855, the problem of

simultaneous transmission in the same direction, which naturally suggested itself as the next step in the progress of invention, was solved with more or less success by the independent labors of Dr. J. B. Stark of Vienna, Dr. Werner Siemens, Dr. August Kramer and A. Bernstein, of Berlin, and Dr. J. Bosscha Jr., of Leyden; each of these inventors having published a full account of his method in the latter part of 1855 and the early part of 1856. At least two of them, Stark and Bosscha, clearly saw that the successful solution of the difficult problem of simultaneous transmission in the same direction included as a necessary consequence the solution of the problem of quadruple transmission also; for a knowledge of the invention of Gintl as perfected by Frischen, was all that was needed to show that it was equally applicable

to transactions, Vol. IV. p. 101, not only makes the same suggestion, but sets forth in detail a method of accomplishing the result. Having described his method of double transmission in the same direction he says: "Now, if we wind each of the receiving relays with two wires, and divide the current at the sending station according to the plan of Siemens and Halske (Frischen) through the two coils of the home relay in opposite directions, then it becomes practicable for both stations to transmit at the same moment without their own relays being affected by their own transmitted currents, and in this manner it is possible to send four signals simultaneously through one wire. This solves the problem in its largest generality."

Thus Stark and Bosscha, as early as 1855, both recognized the indisputable fact, that the production of a successful method of quadruplex transmission, depended solely upon the successful solution of the problem of double transmission in the same direction.

If this could be accomplished, it becomes a mere matter of mechanical detail to combine with it Frischen's or any other system of counter-transmission.

It has been stated that methods of double trans-

mission in the same direction were worked out independently, but almost coincidentally, by a number of inventors during the year 1855. The ingenious and active German electricians, recognizing that the accomplishment of this result was the key to simultaneous quadruplex transmission, had diligently labored at the problem. Let us now consider the results of their labors.

In any system of simultaneous double transmission in the same direction, two keys are required at the sending station, and at least four different electrical conditions of the line must be provided for, one for each of the four following cases:

1. When the first key is closed and the second key open.
2. When the second key is closed and the first key open.

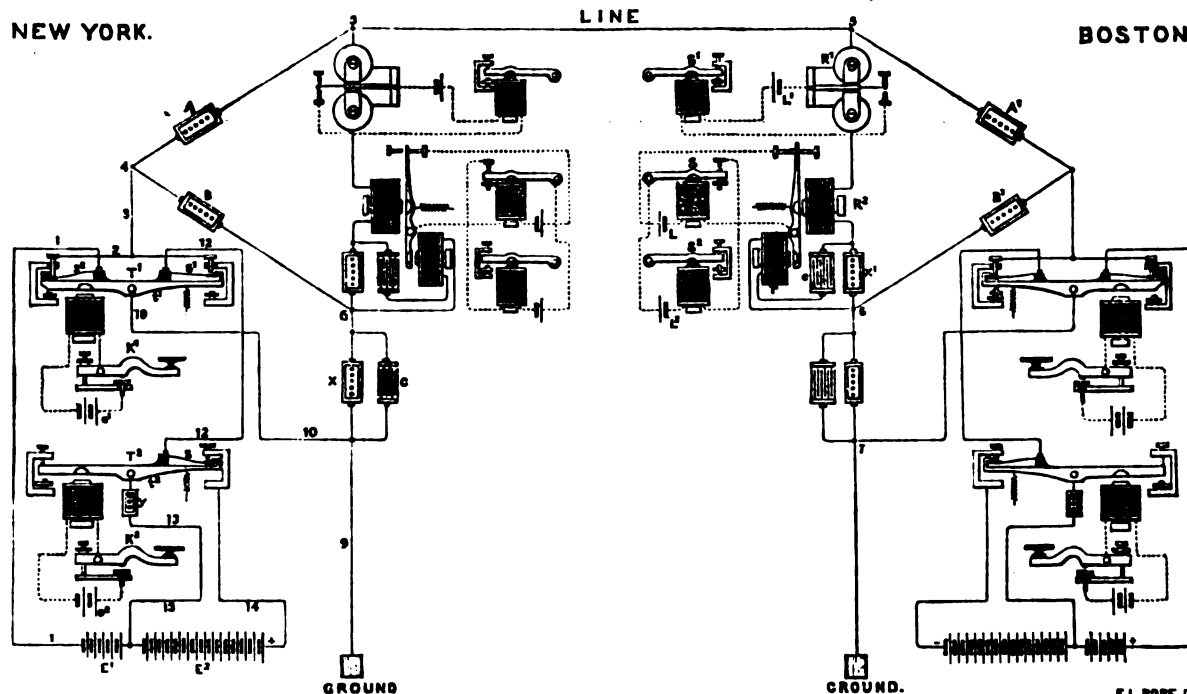


Figure 1.

either to a single or a double telegraph in one direction. In the first published description of his method, dated at Vienna, October 31, 1855, Stark concludes as follows:

"With the method of double transmission in the same direction, we may also combine that of counter-transmission (*gegensprechen*), and hence arises the possibility of simultaneously exchanging four messages upon one wire between two stations, which will however hardly find any application in practice." This is unquestionably the earliest-published suggestion of what is now known as the quadruplex system.

Dr. Bosscha, in a description of his system read before the Royal Academy of Sciences of Holland, on the 27th of October, 1855, and published in their



3. When both keys are closed.

4. When both keys are open.

The methods of Stark, Siemens, and Bernstein, (No. 1) though varying in detail, were arranged upon one general principle, the four electrical conditions of the line being as follows:

1. A positive current having a strength of 1.
2. A positive current having a strength of 2.
3. A positive current having a strength of 3.
4. No current.

The methods of Bernstein (No. 2), Bosscha, and Kramer, and at a later date those of Schreder (1860), and Maron (1862), were arranged upon another and better principle, as follows:

1. A positive current having a strength of 1.
2. A negative current having a strength of 1.
3. A positive (or negative) current having a strength of 2.
4. No current.

There are two serious difficulties, leaving minor ones out of consideration, which are inherent in every system of simultaneous double transmission in the same direction. In the first place, when either key is passing from its front to its rear contact, it causes a momentary interruption of the signal which is at the same time being transmitted by the other key. Neither Stark nor Siemens suggested any means of overcoming this difficulty. Bosscha and Kramer made use of a device originally invented by Gintl,† viz. that of keeping the battery constantly in the main circuit, but shunted by the key, so that when the latter was depressed the short circuit was broken and the current flowed to line, but when raised the battery was again short-circuited. This plan effectually disposed of the difficulty in question, but was injurious in its effect upon the batteries. Bernstein, however, hit upon the method now in use, that of providing each of his keys with a spring so arranged as to close the front contact at or before the time of interrupting the rear contact. This difficulty was, therefore, effectually removed as early as 1855. The second difficulty is a still more serious one, and arises in the following manner: In the simultaneous operation of the apparatus there must, of necessity, frequently be a change from a positive to a negative condition, or *vice versa*, of the line, and of the relays or receiving instruments, consequent upon the movement of a single key; yet it is evident that the reversal of the magnetic polarity of a receiving instrument by the action of one key must interfere with a signal which is being given upon it at the same time by the action of the other key. This difficulty is met with, in some form, in every arrangement of the receiving instruments. Stark employed three neutral relays adjusted to varying degrees of sensitiveness in one arrangement, and two polarized and one neutral relay in another, as did also Bosscha and Kramer. Bernstein used a single relay with three armatures, of varying adjustment. Neither Stark nor Siemens suggested any method of remedying this serious defect, and judging from his published paper on the subject, the latter evidently considered it an insurmountable one. Bosscha, Bernstein, and Kramer, by making use of different modifications of the same principle, that of operating the recording instrument or sounder by the opening of a shunt circuit, as the first and last had already done with the main batteries, and by working from the rear instead of the front contact of the receiving relay, theoretically succeeded in surmounting this obstacle. Practically, however, the method of operating a register or sounder by closing and breaking a shunt, is a very unsatisfactory one. It not only exhausts the local battery with great rapidity, but the demagnetization of the iron cores takes place with

far less rapidity when the battery is cut off by a shunt even of very small resistance, than when it is completely interrupted by breaking the circuit in the usual way, and this renders it impossible to receive and record the telegraphic signals with the rapidity that is necessary in modern telegraphy.

When these methods came to be tried on lines of a length exceeding 100 or 150 miles, the interference of the static discharges was superadded to the already existing difficulties, and for these reasons the results were on the whole so unsatisfactory that the subject remained in abeyance for many years. The subsequent labors of Schreder, Wartmann, Maron, Schaak, and Zetsche, between 1855 and 1865, though exhibiting great ingenuity and research, added little or nothing of practical value to what had already been done by the earlier inventors in the same field.

The revival of the duplex system in America, and its extensive introduction into practical use, both in this country and in Europe, resulting from the improvements of Joseph B. Stearns,—notably his method of compensating the effects of the static discharge from the line by the application of the condenser, which was made known in the winter of 1871—2—once more turned the attention of electricians to the problem of simultaneous transmission in the same direction.

In a paper published in the *Philosophical Magazine* of June, 1873, Oliver Heaviside, of Newcastle-on-Tyne, England, pointed out, as Stark and Bosscha had done before him, that the invention of a system of simultaneous transmission in the same direction furnished at the same time the solution of the problem of quadruple transmission. He says: "It is theoretically possible to send any number of messages whatever simultaneously in one and the same direction upon a single wire. Now by combination with a null duplex system it becomes obviously possible to send any number of messages in the other direction while the opposite correspondences are going on, and without interference. Thus the working capacities of telegraphic circuits may be increased indefinitely by suitable arrangements. \* \* \* From experiments I have made I find it is not at all a difficult matter to carry on four correspondences at the same time, namely, two in each direction, and if we may suppose the growth of telegraphy will be as rapid in the future as it has been in the past, it seems not improbable that multi-telegraphy will become an established fact."

During the summer of 1874, T. A. Edison, of Newark, N. J., while engaged in conjunction with George B. Prescott, electrician of the Western Union Telegraph Company at New York, in experimenting upon Stearns's duplex apparatus with a view of introducing certain modifications and improvements therein, devised a system of simultaneous transmission in the same direction which differed materially in principle from any of its predecessors, and which was destined to furnish the basis of the first practical solution of the curious and interesting problem of quadruple telegraphy.

The distinguishing principle of this method consists in combining together two distinct and unlike methods of single transmission, in such a manner that they may be carried on independently upon the same wire, and at the same time, without interfering with each other. One of these methods of single transmission is used principally in England, where it is known as the double-current system, and the other is the single-current or open circuit system, used on the continent of Europe. In the double-current system the battery remains constantly in connection with the line at the sending station, its polarity being completely reversed at the beginning and at the end of every signal without breaking the circuit. The

receiving relay is provided with a polarized or permanently magnetic armature, but has no adjusting spring, and its action depends solely upon the reversals of polarity upon the line, without reference to the strength of the current. In the single-current system, on the other hand, the transmission is effected by closing and breaking, or increasing and decreasing the current, while the relay has a neutral or soft iron armature, provided with a retracting spring. In this system the action depends solely upon the strength of the current, its polarity being altogether a matter of indifference.

It will therefore be apparent that by making use of these two distinct qualities of the current, viz. polarity and strength, two sets of instruments may be operated, at the same time, on the same wire. This method possesses, moreover, the important practical advantage that the action of each of the two receiving relays is perfectly independent. Each receiving operator controls his own relay and can adjust it to suit himself without interfering with the other, a peculiarity that none of the former methods possessed. As soon as this method was practically worked out, it became at once obvious that any of the different methods of simultaneous transmission in opposite directions already in use might be applied to it, as Stark, Bosscha, and others had long ago pointed out, the result of which would be a practical system of quadruple transmission. This was shortly afterwards done upon the lines of the Western Union Telegraph Company between New York and Boston, a distance of 240 miles, and both the bridge and the differential system of duplex working were tried in combination with it, with excellent results. When, however, the apparatus was experimentally tested on a circuit of about 450 miles, the effects of static induction became very strongly marked, and it was found that these could be more conveniently compensated in the bridge than in the differential system. The former was, therefore, decided upon as being better suited to the usually existing conditions than the latter.

The diagram shows the quadruple apparatus as arranged upon the bridge quad.

$T_1$  is a double current transmitter or pole-changer, operated by an electro-magnet, local battery  $E_1$ , and finger key  $K_1$ , in a manner well understood. The office of the transmitter  $T_1$  is simply to interchange the poles of the main battery  $E_1$  with respect to the line and ground wires, whenever the key  $K_1$  is depressed; or, in other words, to reverse the polarity of the current upon the line by reversing the poles of battery  $E_1$ . By the use of properly arranged spring contacts  $s_1, s_2$ , this is done without at any time interrupting the circuit. Thus the movements of the transmitter  $T_1$  cannot alter the strength of the current sent out to the line, but only its polarity or direction. The second transmitter  $T_2$  is operated by a local circuit and key  $K_2$  in the same manner. It is connected with the battery wire 12, of the transmitter  $T_1$  in such a way that when the key  $K_2$  is depressed, the battery  $E_1$  is enlarged by the addition of a second battery  $E_2$  of two to three times the number of cells, by means of which it is enabled to send a current to the line of three or four times the original strength, but the polarity of the current with respect to the line of course still remains as before, under control of the first transmitter  $T_1$ .

At the other end of the line are the two receiving instruments  $R_1$  and  $R_2$ .  $R_1$  is a polarized relay with a permanently magnetic armature, which is deflected in one direction by positive, and in the other by negative currents, without reference to their strength. This relay consequently responds solely to the movements of key  $K_1$ , and operates the sounder  $S_1$ , by a local circuit from battery  $L_1$  in the usual man-

† Brix's Journal, II. 135.

ner. Relay  $R_2$  is placed in the same main circuit, and is provided with a neutral or soft iron armature, and responds with equal readiness to currents of either polarity, provided they are strong enough to induce sufficient magnetism in its cores to overcome the tension of the opposing armature-spring. The latter, however, is so adjusted that its retractile force exceeds the magnetic attraction induced by the current of the battery  $E_1$ , but is easily overpowered by that of the current from  $E_1$  and  $E_2$  combined, which is three or four times as great. Therefore, the relay  $R_2$  responds only to the movements of key  $K_2$  and transmitter  $T_2$ .

The same difficulty which had baffled former inventors arises, however, in this connection. When the polarity of the current upon the line is reversed during the time in which the armature of  $R_2$  is attracted to its poles, the armature will fall off for an instant, owing to the cessation of all attractive force at the instant when the change of polarity is actually taking place, and this would confuse the signals by false breaks if the sounder were connected in the ordinary way. By the arrangement shown in the figure, the armature of the relay  $R_2$  makes contact on its back stop, and a second local battery  $L_2$  operates the receiving sounder  $S_2$ . Thus it will be understood that when relay  $R_2$  attracts its armature, the local circuit of sounder  $S_2$  will be closed by the back contact of local relay  $S$ ; but if the armature of  $R_2$  falls off it must reach its back contact, and remain there long enough to complete the circuit through the local relay  $S$ , and operate it, before the sounder  $S_2$  will be affected. But the interval of no magnetism in the relay  $R_2$ , at the change of polarity, is too brief to permit its armature to remain on its back contact long enough to affect the local relay  $S$ , and through the agency of this ingenious device the signals from  $K_2$  are properly responded to by the movements of sounder  $S_2$ .

By placing the two receiving instruments  $R$  and  $R_1$  in the bridge wire of a "Wheatstone balance," according to Stearns's patent of Nov. 12, 1872, and duplicating the entire apparatus at each end of the line, the currents transmitted from either station do not affect the receiving instruments at that station. Thus in figure 1 the keys  $K_1$  and  $K_2$  are supposed to be at New York, and their movements are responded to only by the receiving relays  $R_1$  and  $R_2$  at Boston. The duplicate parts which are not lettered operate in precisely the same manner, but in the opposite direction with respect to the line.

In applying this system of quadruplex transmission upon lines of considerable length, it was found that the interval of no magnetism in the receiving relay  $R_2$ , (which, as above stated, takes place at every reversal in the polarity of the line current), was greatly lengthened by the action of the static discharge from the line, so that the contrivance of the local relay  $S$  was not sufficient to overcome the difficulties arising therefrom. A rheostat or resistance,  $X_1$ , was therefore placed in the bridge-wire with the receiving instruments,  $R_1$  and  $R_2$ , and shunted with a condenser  $c$ , of considerable capacity. Between the lower plate of the condenser and the junction of the bridge and earth-wire an additional electro-magnet,  $r$ , was placed, acting upon the armature lever of the relay  $R_2$ , and in the same sense. The effect of this arrangement is, that when the current of one polarity ceases, the condenser  $c$  immediately discharges through the magnet  $r$ , which acts upon the armature lever of relay  $R_2$ , and retains it in position for a brief time before the current of the opposite polarity arrives, and thus serves to bridge over the interval of no magnetism between the currents of opposite polarity.

It will be seen that the combination of transmitted

currents in this method differs materially from any of those used in previous inventions. They are as follows:

1. When the first key is closed and the second open ..... - 1
2. When the second key is closed and the first open ..... + 3 or + 4
3. When both keys are closed ..... - 3 or - 4
4. When both keys are open ..... + 1

Here we discover another very important practical advantage in the system under consideration, which is due to the fact that the difference or working margin between the strengths of current required to produce signals upon the polarized relay and upon the neutral relay respectively, may be increased to any extent which circumstances render desirable. Within certain limits, the greater this difference, the better the practical results, for the reason that the range of adjustment of the neutral relay increases directly in proportion to the margin. The ratio of the respective currents has been gradually increased from 1 to 2 to as high as 1 to 4, with a corresponding improvement in the practical operation of the apparatus.

From what has been said, therefore, it will be seen that before it became possible to produce a quadruplex apparatus capable of being worked at a commercial rate of speed upon long lines, it was essential that its component parts should have arrived at a certain stage of development. When in the early part in 1872, simultaneous transmission in opposite directions was for the first time rendered practicable upon long lines by the combination therewith of the condenser, the first step was accomplished. It now only remained to invent an equally successful method of simultaneous transmission in the same direction, which, as we have seen, was done in 1874. The application of one or more of the existing duplex combinations to the new invention to form a quadruplex apparatus followed as a matter of course.

Thus it is clear that the merit of the invention of 1874 consists in its having furnished us with a new, and what is more important, a practical method of simultaneous transmission in the same direction, applicable to long lines, and not in the mere application thereto of one or more of the known duplex systems, to form a quadruplex, which in itself would no more constitute an invention in the sense contemplated by the patent law, than would the application of the duplex principle to the printing or dial instrument instead of the Morse, with which it was first used.

As its use becomes more and more extended, the quadruplex is constantly undergoing modification and improvement in its minor details, with a view to render its manipulation more simple and easy, and to enable it to be worked direct between the most widely separated points with the utmost speed and certainty. Some of these modifications are very ingenious and interesting, and will probably form the subject of a future article.

RESEARCHES ON MAGNETIC ROTATORY POLARIZATION. —M. H. Becquerel.—Since Faraday's discovery the phenomenon of magnetic rotatory polarization has been the subject of numerous researches. It has been remarked that bodies strongly refractive have generally also a great magnetic rotatory power; but the exceptions to this rule have hitherto prevented any connection between these two physical attributes from being established. The author finds in his experiments that many bodies present a regular increase of rotation as the index of refraction augments. The exceptions observed may be attributed either to the effects of lamellar polarization, as in the diamond and garnet; or to the presence of magnetic bodies; or, lastly, to unknown causes.—*Comptes Rendus*, vol. lxxx, No. 22.

## INVIOABILITY OF TELEGRAPH MESSAGES.

The prosecution instituted against a Newry shipbroker, for inducing a telegraph clerk, by pecuniary bribes, to give him information respecting the arrival of foreign vessels, has excited, from its novelty, considerable attention. From what transpired before the Newry Bench on Monday, it seems that the accused, who occupies a respectable position as a general grocer as well as shipbroker, put himself in communication with a telegraph clerk, named Whittaker, with the object of inducing him to intercept and disclose certain messages. After some time the boy was induced to enter upon this very dishonest and dangerous course for a consideration of half-a-crown for every message disclosed. Because of some complaints made to the local Postmaster, suspicions were excited, and the collusion between the clerk and shipbroker detected. The former was summarily dismissed, and a prosecution entered against the latter for inducing Whittaker to commit a misdemeanor. The prisoner was committed for trial at the Downpatrick Assizes, bail being accepted for his appearance. It is only right and proper that the Postoffice authorities should take the most stringent measures against the persons implicated in these proceedings. Telegraph officials are entrusted with a highly responsible duty. In point of fact nearly every man who sends away a message makes them his confidants. Upon their strict honesty and thorough trustworthiness a great deal often depends. If confidence were once shaken in the integrity of telegraph officials the usefulness of the system would be in a great measure destroyed. The inviolability of a message is not to be outraged with impunity, if at all possible, in even a single case. Hence we view with satisfaction the steps which the Postoffice authorities have taken. The fact that the Newry prosecution is the first that has been instituted, at least in Ireland, under an act passed for the protection of the senders and receivers of telegrams, shows unmistakably how trustworthy the officials as a body are. It is conclusive testimony of the efficient and faithful manner in which they perform their duties. Nothing could be more creditable to the body than the fact that the Newry prosecution has been the first. For the sake of all parties let us trust it will be the last. —*The Derry (Ireland) Journal*.

## TELEGRAPHY IN AUSTRALIA.

A feat of telegraphy was performed for the *Argus* and the *Australasian* on the arrival of the mail steamer at Adelaide. The letters of our London correspondents, comprising some 20,000 words, were transmitted from Adelaide by wire, and appeared in the *Argus* and in the country edition of the *Australasian* at least 36 hours before the R.M.S. Nubia can be expected to reach Hobson's Bay. It may be imagined that so great an addition to the ordinary work thoroughly tested the efficiency of the arrangements of the telegraph department, and acknowledgment is due for the energetic and successful manner in which the extra strain on the officials was encountered. —*The Australasian*.

## THE TELEGRAPH IN NEW CALEDONIA.

The extension of the telegraph communication from the capital of the French penal colony in New Caledonia to the principal villages and government depots is being pushed forward vigorously, and a large staff is engaged along the route of the proposed line, from Canala to Uarai. This will be an expensive work, as the wires are to run through a dense forest and cross the main range at a height of about 2,500 feet above the sea.

TABLE, showing the extent of Governmental Telegraphs, together with the Receipts and Expenses for the year ending December 31st, 1873, compiled from the Official Reports by the  
JOURNAL TELEGRAPHIQUE.

Object of Statistics.	Germany.			Austro-Hungary.		Belgium.	Den- mark.	France.	Great Britain.			Italy.	Norway.	Netherlands.		Russia.	Servia.	Sweden	Switz'r'd	Portugal	Romania
	German Empire.	Bavaria.	Wurttem- berg.	Austria.	Hun- gary.				Great Britain.	British Indo- Europ'n	British India.			Holland	Dutch Indies.						
Length of lines in miles.....	19,040	4,295	1,437	18,876	8,337	2,932	1,580	30,941	94,266	3,381	15,590	12,546	4,253	2,097	3,219	36,860	908	5,149	3,631	1,963	2,125
" " wires ".....	64,894	14,298	3,081	48,613	28,355	12,589	4,373	79,471	106,770	3,468	32,029	43,043	6,495	7,294	3,869	71,360	1,353	13,679	8,604	3,942	3,784
Government Offices.....	1,469	393	257	797	351	427	108	2,281	3,751	10	203	877	101	149	58	671	35	129	715	122	73
Railroad or Private Offices.....	1,856	390	.....	1,077	486	120	69	1,454	1,821	..	635	563	62	166	.....	827	.....	240	85	.....	..
Total Offices.....	3,325	783	257	1,874	837	547	177	3,735	5,572	10	838	1,440	163	315	58	1,498	35	369	800	122	73
Interior Messages sent.....	7,294,352	684,537	267,221	3,049,498	2,039,352	1,732,907	240,565	\$6,032,118	17,661,749	.....	624,375	3,909,541	400,803	1,309,013	220,548	2,612,770	92,795	646,118	1,641,075	204,000	524,965
International Messages sent.....	1,543,317	373,002	187,526	715,754	92,360	321,524	109,093	887,264	1,082,901	29,527	26,821	338,226	105,857	281,766	7,716	274,527	25,714	122,923	278,223	43,674	95,488
Total Messages sent.....	8,767,669	1,057,539	454,747	3,765,252	2,131,712	2,054,431	349,658	6,919,382	18,744,650	29,527	651,796	4,267,767	506,390	1,590,779	228,264	2,887,297	118,509	769,041	1,919,298	247,674	620,453
Receipts of Interior Messages.....	\$1,367,966	\$89,616	\$33,335	\$1,373,075	\$538,906	\$181,480	\$46,295	\$1,428,005	\$4,085,480	.....	\$323,856	\$978,658	\$136,202	\$162,751	\$129,191	\$2,730,878	\$20,113	\$191,777	\$173,826	\$50,283	\$142,029
" " International ".....	1,076,369	145,841	42,723	128,741	28,232	172,866	89,865	1,163,638	637,210	277,372	254,014	433,673	84,788	104,435	18,834	733,213	10,451	133,701	129,415	26,563	20,889
Sundry Receipts.....	16,410	2,394	2,578	128,741	28,232	441	2,931	281,444	241,975	3,911	11,197	16,030	1,586	.....	1,153	51,526	2,305	3,429	21,962	2,167	3,725
Total Receipts.....	\$2,460,045	\$230,851	\$78,636	\$1,501,816	\$587,138	\$354,287	\$139,091	\$2,878,087	\$5,024,665	\$281,283	\$769,067	\$1,428,361	\$212,576	\$267,186	\$140,178	\$3,515,311	\$22,869	\$328,907	\$325,203	\$79,013	\$166,643
Extraordinary Expenditures.....	\$340,772	\$10,541	\$82,459	\$239,858	\$71,284	\$70,080	\$33,909	\$267,900	\$1,603,630	\$69,683	\$569,488	\$121,600	\$41,590	\$45,520	\$31,268	\$399,470	\$5,978	\$91,604	\$34,441	.....	\$19,000
Ordinary Expenditures.....	2,747,917	153,571	87,933	1,663,507	736,884	406,978	127,443	2,468,100	4,539,794	321,350	1,262,790	1,026,921	187,912	393,372	232,964	2,838,553	61,174	260,641	298,181	\$151,000	380,977
Total Expenditures.....	\$3,088,689	\$164,112	\$170,392	\$1,903,365	\$798,168	\$477,058	\$161,352	\$2,736,000	\$6,145,414	\$390,933	\$1,832,278	\$1,148,521	\$229,502	\$438,892	\$264,232	\$3,238,923	\$66,452	\$352,245	\$332,622	\$151,000	\$599,977

## THE PERILS OF AUSTRALIAN TELEGRAPHY.

The *South Australian Register* of July 14th last, publishes an account of the murder of the station-master at Daly Waters, of the Port Darwin telegraph line, by savages. It says:

"About three weeks ago, Mr. C. H. Johnston, the station-master at Daly Waters, telegraphed for permission to proceed to the Roper River, in order to look after some Government horses and cattle which were known to be straying in that locality. The necessary sanction having been given, he started in company with Messrs. Daer and Rickards and one or two blacks. Nothing more was heard of the party until Tuesday, July 13th, when Messrs. Daer and Rickards returned to Daly Waters with the report that they had been attacked by the natives, and that Mr. Johnston had been murdered. It appears that the attack was made on the 29th of June—Mr. Johnston being speared on the left side of the abdomen. Situated as they were, his companions could do little for him with such a dangerous and probably poisonous wound. The poor fellow lingered till the following day, when, as the telegram informs us, he 'died easily.' Both Daer and Rickards were wounded, the former on the nose, and the latter on the breast, but not seriously. They managed to reach the station, though in a very exhausted condition. With this second painful evidence of the savagery of the aborigines in the interior, it is to be hoped that the utmost care will be taken by the authorities to keep the officers of the various stations as near home as possible. The recovery of a few horses is nothing to the life of a faithful servant; and although in this case the suggestion emanated from the person who lost his life, still, with regard to any such proposed future expeditions, a firm refusal, except under very special circumstances, should be given by the superintendent of telegraphs, and this we are sure, after the tragedy which has just been enacted, he will be careful to do. Mr. Johnston entered the telegraph service in September, 1872; when he was appointed an operator on the overland line. He was stationed at the Katharine, and in May last was transferred to Daly Waters."

## EFFECTS OF STRESS UPON THE MAGNETISM OF SOFT IRON.

In the physical laboratory at Glasgow University, Sir William Thomson stretched steel and soft iron wire, about twenty feet long, from the roof. An electro-magnetic helix was placed around a few inches of the wire, so that the latter could be magnetized when an electric current was passed through the former, the induced current thus produced in a second helix outside the first being indicated by a second galvanometer. When steel wire was used, the magnetism diminished when weights were attached to the wire, and increased when they were taken off; but when special soft iron wire (wire almost as soft as lead) was used, the magnetism was increased when weights were put on, and diminished when they were taken off. Afterwards he discarded the electrical apparatus; and by suspending a piece of soft wire near a magnetometer consisting of a needle, a small fraction of a grain in weight, with a reflecting mirror attached, the wire was magnetized inductively simply by the magnetism of the earth, and changes in its magnetism were made by applying weights and strains, the changes being then indicated by the magnetometer.

Unpolarized electrodes are obtained by using amalgamated zinc and a weak solution of zinc sulphate. If there be free sulphuric acid, it should be neutralized by carbonate of zinc. Common zinc may also thus be used.



## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

SEPTEMBER, 1875.

## APPOINTMENTS.

J. Sander, B'way & Dey st.	W. P. Donsley, St. Joe, Mo.
J. J. Carr, " "	S. J. Kelley, " "
D. C. Donoghue, " "	J. L. Williams, St. Louis, " "
J. F. Campbell, " "	M. Tully, " "
J. Davis, " "	M. Ryan, " "
W. S. Glassey, " "	W. E. Cartwright, " "
J. S. Horn, " "	J. Goodin, " "
F. Loury, " "	J. H. McGuire, Omaha, Neb.
W. J. McNamara, " "	H. M. Goewey, " "
D. B. Mitchell, " "	C. F. Drake, Salt Lake, Utah.
E. W. Cogley, 14 Broad street	L. A. McCarthy, East Bradys,
E. G. DeLaoy, 331 st. & 11th	Pa.
Miss B. K. Phipps, A. 1st Fair	E. K. Redrup, Ft. Wayne, Ind.
G. L. Richmond, G. C. Depot.	L. S. Jeffords, Foxburg, Pa.
W. O. Shipman, 791 Broadway	J. S. Gould, Parkers Landing,
A. Wohlbrake, Madison square	Pa.
G. A. Warrell, 516 Broadway.	J. A. Barnhart, Smith's Mills,
F. Cummings East New York.	Pa.
G. Halsey, Bridgehampton, L. I.	A. H. Habb, Cleveland, Ohio.
C. H. Higgins, Quarantine, S. I.	B. P. Holmes, " "
W. V. Montalbo, Rondout,	D. Mason, Detroit, Mich.
N. Y.	J. L. McDonnell, Detroit, Mich.
B. Penney, Woodsburgh, L. I.	James Green, East Saginaw,
W. J. Turney, Chappaqua, N. Y.	E. W. Merker, Fostoria, Ohio.
J. N. Worl, Ravenswood, L. I.	G. W. Foster, Three Rivers,
H. W. Young, Springfield, " "	Mich.
A. H. Nason, Alford, Me.	C. E. Glass, Arcadia, Ind.
S. B. Palmer, Bar Mills, Me.	E. W. Allen, Lafayette, Ind.
John B. Abbott, Centre Water-	L. V. McIntyre, Logansport,
bury, Me.	Ind.
G. W. Hammond, Cumberland	J. E. Friend, Terre Haute, Ind.
Me.	L. Smith, Urbana, Ohio.
F. A. Wood, East Lebanon	R. Morris, Columbus, Ohio.
Me.	Wm. Tucker, " "
Miss Tibbitts, East Rochester	H. A. Crippen, Albany, N. Y.
N. H.	R. J. Mallett, Sharon Springs,
S. Hinkley, Gorham, Me.	N. Y.
F. A. Poland, Morrills Corner,	W. M. Mallett, Syracuse, N. Y.
Me.	D. H. Christie, Nyack, " "
A. W. Nason, Rochester, N. H.	W. H. O'Keefe, Cleveland, Ohio
Abbie Lord, Springdale, Me.	J. A. Gleason, Goshen, Va.
J. W. Webb, Saccarappa, " "	Mrs. J. D. Perry, Shelby, N. C.
Lucy E. Allen, South Waterloo,	J. E. Hurley, Augusta, Ga.
Me.	E. H. Gordon, Pensacola, Fla.
L. H. Parker, Barnet, Vt.	J. W. Ferriss, St. Elmo, Ala.
J. M. Fraser, South Royalton,	H. A. Friar, Chef Menteux, La.
Vt.	F. B. Hunter, Mauchac, La.
A. L. Allison, West Boylston,	John Wood, Chrystal Springs,
Mass.	Miss.
Wm. Perterson, Boston, Mass.	L. Evans, Atlantic City, N. J.
J. H. Busby, " "	J. H. H. Wilner, Bulls Island,
Miss E. M. Kite, " "	E. L. McNelt, Carpenter, Pa.
Geo. Wheelock, " "	A. M. Kautz, Cataasqua, Pa.
E. B. Pillsbury, " "	Francis Coleman, Clarkesboro,
M. J. Holland, " "	N. J.
Miss E. T. Spencer, Craunton,	C. L. Briggs, Dalton, Pa.
R. I.	A. L. Heaver, Easton, Pa.
C. H. Thomas, Duxbury Mass.	J. L. Burt, Florence, N. J.
E. D. Tucker, Kingston, R. I.	F. Chauncy, Gilletts, Pa.
Miss M. A. Poland, North	A. B. Peifer, Hicks Ferry, Pa.
Brookfield, Mass.	Ross Slack, Hopewell, N. J.
W. S. De Wolf, New Bedford,	S. W. Jackson, Moores, Pa.
Mass.	Mrs. D. Laferty, Phoenixville,
J. McGuire, Providence, R. I.	Pa.
J. H. McNully, " "	T. P. Rockwell, Roaring Branch,
J. S. Hall, Vineyard Haven, Ms	Pa.
V. C. Miller, Cedar Rapids, Ia.	W. S. Barrett, Squam, N. J.
W. E. Davidson, Keokuk, Ia.	M. Keller, Schuylkill Haven,
E. Shyles, Kankakee, Ill.	Pa.
E. P. Delano, Peoria, Ill.	John T. Naylor, Wilkesbarre,
A. R. Warren, Quincy, " "	Pa.
J. Snell, Racine, Wis.	A. C. Chandler, Wilkesbarre,
Bessie DeLong, Chicago, Ill.	Pa.
T. G. Colburn, " "	Harry Smith, Bardwell, Ky.
G. R. Waterhouse, " "	Frank Lee, Lexington, Ky.
J. S. May, Parsons, Ky.	A. C. McCullar, Chewalla, Ten.
W. A. Pillow, Austin, Tex.	A. R. Lensing, Mason, " "
E. C. Harrell, " "	J. B. Smith, Annapolis Junct.
G. Francke, Dallas, " "	Md.
J. C. DeLong, Denver, Col.	J. P. McKenny, Jr., Cairo, W.
L. C. Nicourd, Galveston, Tex.	Va.
C. E. Smalles, Houston, " "	E. J. C. A. Hull, Fulton Station,
W. H. Morris, " "	Md.
J. A. Hagerland, Jefferson, " "	A. T. Roeder, Winchester, Va.
G. W. Myers, Kansas City, Mo.	G. H. Chute, Bedford, N. S.
E. D. Moore, " "	S. Snow, Lockport, " "
C. H. Patch, " "	A. Miller, Port Hastings, C. B.

## RESIGNATIONS.

Miss Annie Baker, B'way & Dey	Miss M. E. Kinley, Crawford
Miss F. L. Piko, " "	House.
W. W. Currier, " "	Miss M. J. Baucroft, Fabyan
J. F. Hurley, " "	House.
C. H. Smith, " "	Miss A. F. Howe, Glen House.
C. H. Thomas, " "	Miss J. L. Granville, Highgate
H. Lee, " "	Spring.
C. F. Bennett, " "	E. P. Hitchcock, Lake Dun-
R. Watson, 1205 Broadway.	more.
G. Toble, Washington Market.	A. B. Howe, Mt. Washington,
S. Williams, " "	N. H.
J. Darrach, 407 Broadway.	M. Priest, Mt. Washington De-
R. G. W. Dennison, G. C. Depot	pot, N. H.
C. F. Chase, Saratoga, N. Y.	F. Gove, Profile House.
G. Wheelock, " "	Miss J. L. Prindle, South Royl-
S. R. Applegate, Long Branch,	ton, Vt.
N. J.	E. A. Blake, Twin Mountain
G. H. Morgan, Chappaqua, N. Y.	House, N. H.
J. Brennan, Quarantine, S. I.	W. P. Merril, Waumbeck H.
V. R. Baldwin, Rondout, N. Y.	G. R. Murdock, West Boylston,
Miss E. L. French, Bethlehem,	Mass.
N. H.	C. Connolly, Boston, Mass.

Miss E. S. Thayer, Boston, Ma.	Miss L. Christie, Nyack, N. Y.
H. N. Williams, " "	B. O. Palmer, Wayland, " "
Miss Davis, New London, Ct.	S. E. Keesley, Cleveland, Tenn.
W. A. Hennessey, Newport, R. I.	A. J. Best, Goshen, Va.
Peter Cunningham, " "	R. Lipcomb, Greenbrier, W. Va.
W. S. Poland, North Bloomfield	O. G. Womble, Healing Springs,
Mass.	H. F. Line, Sweet Chalybeate
J. S. Hall, New Bedford, Mass.	springs.
Miss L. Crocker, Oak Bluffs,	L. G. Anderson, Sweet Springs
Mass.	W. R. Parry, Yellow Sue Spgs.
J. H. Lovett, Providence, R. I.	S. W. Capers, Charleston, S. O.
L. J. McLaughlin, " "	Mobley, Pensacola, Fla.
Miss Belle Davis, Watch Hill,	H. A. Friar, St. Elmo, Ala.
R. I.	Wyggle, Chef Menteux, La.
Miss E. M. Kite, Woods Hole,	J. J. McNavin, Chrystal Spring
Mass.	Miss.
Miss K. Searles, Cedar Rapids,	J. D. Howard, Mauchac, La.
Iowa	W. O. Eastlake, Jersey City,
S. G. McDonnol, Kankakee, Ill.	N. J.
J. K. Goodwin, Peoria, Ill.	James T. Igoe, Shamokin, Pa.
Marshall, Racine, Wis.	Wm. Higbee, Atlantic City, N. J.
J. Snell, Chicago, Ill.	W. R. Browne, Bulls Island,
T. Albern, " "	N. J.
—Simms, Parsons, Kan.	S. A. Dinkey, Cataasqua, Pa.
C. D. Hays, Austin, Tex.	A. M. Kautz, " "
J. J. city, " "	D. Wisotzky, Gettysburg Spgs.,
M. W. Connolly, Dallas, Tex.	Pa.
P. W. Hilton, Delhi, La.	W. W. Gibbs, Hopewell, N. J.
W. S. Pierson, Denver, Col.	J. B. Davis, Hicks Ferry, Pa.
G. S. Links, Houston, Tex.	N. M. Desmond, Mauch Chunk,
W. A. Ellow, Jefferson, " "	Pa.
C. H. White, Kansas City, Mo.	W. D. Tyler, Minnequa Spring.
Robt. Livingstone, " "	T. Lynch, Mooles, Pa.
J. H. McGuire, St. Joseph, " "	S. B. Reeves, Ocean Grove, N. J.
J. McCabe, St. Louis, " "	G. F. Shinn, Squam, N. J.
J. C. Alexander, Cresson Spgs.,	J. P. Seaman, Waretown, N. J.
Pa.	J. J. Naylor, Wilkesbarre, Pa.
W. A. Ough, East Bradys, Ind.	H. D. Roe, Woodside, Del.
R. H. Lord, Fort Wayne, Ind.	Samuel A. Boyle, Philadelphia.
G. L. Jeffords, Foxbury, Pa.	P. W. Bossart, " "
R. J. Bean, Smith's Mills, Pa.	S. H. Hoone, " "
C. N. Lander, Detroit, Mich.	Charles Morse, " "
Mrs. Eva Ward, East Saginaw,	Za T. Nutt, " "
Mich.	G. J. Frankenberg, Baltimore.
O. M. Sayne, Erie, Pa.	Hugh Hicks, Lexington, Ky.
E. Sherwood, Fostoria, Ohio.	W. E. Woodson, Rocky Hill, Ky.
N. S. Saunders, Little Moun-	J. D. Hurt, Mason, Tenn.
tain, Ohio.	John L. Cooper, Memphis, Ten
W. A. Davis, Three Rivers,	J. L. Harding, Boston, Ky.
Mich.	G. F. Jones, Annapolis Junct.
W. C. Tingle, Toledo, Ohio.	W. E. Grim, Capon Springs, Va.
Ollie Smith, Arcadia, Ind.	J. S. Brainerd, Deer Park, Md.
J. H. Vercoe, Columbus, Ohio.	G. H. Ogle, Fulton Station, " "
W. S. Kimball, Albany, N. Y.	Fred Kurtz, Jordan Springs, Va
D. June, Blodgett's Mills.	Peter Engle, New Windsor, Md.
P. J. Haley, Niagara Falls, N. Y.	J. C. Smith, Winchester, Va.
W. M. Mallett, Sharon Springs,	Wm. Stevens, Jr., Bedford, N. S.
N. Y.	O. H. Chipman, N. Sydney, C. B
T. H. Allen, Syracuse, N. Y.	V. G. Chipman, " "
W. C. Welsh, " "	

## TRANSFERS.

From.	To.
W. J. McLoughlin, Long Branch.	B'way & Dey st.,
C. H. Jennings, " "	" "
Alice Sellers, " "	" "
Mary L. Roseman, Cooper Union,	" "
J. P. Kohler, Cotton Exchange,	" "
Lizzie Mulholland, Williamsburg, L. I.,	" "
G. C. Hinua, Saratoga, N. Y.	" "
F. E. Blanchard, Sandy Hook,	5th Ave. Hotel.
J. C. Belmont, Lake George,	Johnson's Pool R's.
J. G. Daliard, 134 Pearl street,	Cotton Exchange.
F. J. Casey, Long Branch,	Gen. Relief Service.
W. DeKlyn, Corn Exchange,	Washington Mkt.
W. H. Egan, 5th Ave. Hotel,	14 Broad street.
C. Flood, Long Branch,	Corn Exchange.
E. Heischburg, Johnson's Pool R's.,	1205 Broadway.
Marion Klear, Sea Cliff, L. I.,	Tompkinsville.
P. Keegan, Jr., Tompkinsville,	Stapleton, S. I.
L. F. Kiefer, 516 Broadway,	14 Broad street.
J. V. Kane, 791 Broadway,	407 Broadway.
J. McKinney, Madison Square,	5th Ave. Hotel.
M. V. Morgan, Catskill Mt. House,	134 Pearl street.
J. Mitchell, Long Branch,	B'way & Dey st.
W. A. Seymour, 1000 6th Avenue,	516 Broadway.
C. E. Tapley, Washington Market,	1000 6th Avenue.
G. C. Dimmick, Barnet, Vt.,	Hoboken, N. J.
J. C. DeLong, St. Louis, Mo.,	Denver, Col.
C. E. Smalls, Houston, Tex.	Houston, Tex.
C. W. Moore, Salt Lake, Utah,	To Supt.'s Office.
T. Carter, Augusta, Ga.,	Charleston, S. C.
J. A. Hartman, Atlantic City, N. J.,	Philadelphia, Pa.
J. E. Foley, " "	" "
J. C. Moore, " "	" "
J. S. Eves, " "	" "
J. J. Fahey, " "	" "
John Mitchell, Easton, Pa.,	Jersey City, N. J.
T. J. Fahy, Sea Grove Village,	Cataasqua, Pa.
T. H. Hosley, Wilkesbarre, Pa.,	Jersey City, N. J.
S. W. Mickle, Phoenixville, " "	Mauch Chunk, Pa.
J. H. Glineson, Cape May,	Shamokin, " "
H. A. Green, Patucab, Ky.,	Philadelphia, " "
M. Cowie, Halifax, N. S.,	Louisville, Ky.
W. F. Snyder, Lockport, " "	Truro, N. S.
W. E. Earle, Port Hastings, C. B.	North Sydney, C. B.
M. J. Doran, " "	" "
M. Scanlon, " "	" "
D. Hamilton, " "	" "
John Doran, " "	" "
J. F. Edgar, " "	" "
E. F. Howell, " "	" "
J. Mitchell, " "	" "
R. McLean, " "	" "
C. S. Coleman, " "	" "
N. Martell, " "	" "
George Crew, " "	" "
W. C. Upham, " "	" "
J. H. Dunlap, " "	" "
D. Dunlap, Jr., " "	" "
N. H. McQuasue, " "	" "

## IMPORTANCE OF SOLDERING JOINTS.

The following figures, the result of tests made Nov. 4th on wires of the Western Union Company between Baltimore and Washington, the joints of which had been soldered during the past few months, show a very decided improvement as compared with a test of the same wires made just previous to the soldering. The decrease of resistance in the No. 8, plain wire, from 49.20 to 15.12 is especially remarkable.

Gauge of Wire and Quality.	Former Resistance per Mile.	Present Resistance per Mile.
No. 9 galv.	25.32	17.30
" "	24.38	16.99
" "	22.68	13.09
" "	17.70	13.09
" "	18.92	15.43
" "	21.68	13.61
" "	25.16	17.08
" "	22.58	17.08
8 plain	49.20	15.12

## ATLANTIC CABLE BUSINESS.

A correspondent, who is evidently well posted on telegraphic matters, communicates to the *Morning Herald of Halifax, N. S.*, a comparative statement of the traffic and the receipts of the Atlantic Cable during corresponding periods in 1874 and 1875. The concluding portion of the letter is as follows:

"The amounts received by the Anglo-American Telegraph Company, in the three months of 1874, tariff \$1 per word, and for the corresponding period of 1875, with the tariff at 50 cents per word. (Five cables being used in both years.

	1874.		1875.	
	No. of mes.	Am't rec.	No. of mes.	Am't rec.
May	21,384	\$56,216	27,184	\$33,940
June	22,033	58,758	28,892	36,650
July	20,905	56,593	28,897	38,270
	64,292	\$171,567	84,973	\$108,860

Loss to the Company £62,707 on the receipts for the quarter. The reduction of tariff therefore caused a falling off in revenue of 36½ per cent for the three months of its operation, while the increase of message has been 32 per cent. only. I have not at hand the figures of increased expenditure. The shareholders growl at 5 per cent. dividends. With a 25 cent tariff they will get about 2 per cent. for a good while.

What the direct cable, with its limited facilities, will return to the investors, is a mystery which will be cleared up doubtlessly by a bankruptcy or consolidation in due course.

## LEGISLATION FOR THE TELEGRAPH.

The new constitution which is to be submitted to the people of Alabama for their approval some time during this month, contains the following section in relation to lines of telegraph within that State:

"Any association or corporation organized for the purpose, or any individual, shall have the right to construct and maintain lines of telegraph within this State, and connect the same with other lines, and the General Assembly shall, by General law of uniform operation, provide reasonable regulations to give full effect to this section. No telegraph company shall consolidate with, or hold a controlling interest in the stock or bonds of any other telegraph company owning a competing line, or acquire, by purchase or otherwise, any other competing line of telegraph."

## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, November 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

Oxford, Ala., reopened.  
Morton, Cook Co., Ill., changed to Morton Grove, Cook Co. Seneca, Ill. closed.  
California Junction, Iowa, closed.  
Wathena, Ka., closed.  
Hereafter the "tariff for other lines" to Owensboro', Ky., will be 50 and 3 from Evansville, Ind.  
Canton (Balto), Md., an other line office, tariff 15 and 1 from Baltimore.  
Clear Spring, Md., reopened.  
Marion, Md., reopened.  
The P. O. Address of Centre Waterboro', Me., is East Waterboro'.  
Princeton, Mass., is now a W. U. Office, square 28. Check direct.  
Vineyard Haven, Mass., is a W. U. Office, tariff 25 cents more than Wood's Hole. Check direct.  
We are notified by the Mexican lines that all messages for Mexico should be prepaid. They will accept none collect.  
Southern Minn. Junction, Minn., closed.  
Pepe's, Miss., closed.  
Andover Furnace, N. J., given in the Tariff Book, is in Warren Co.  
Messages accepted for Wortendyke, N. J. (office noted as closed in JOURNAL of December 1, 1873), should be checked to Ridgewood.  
Messages taken for Cranbury, N. J., may be delivered by stage from Hightstown. Charges for delivery, 25 cents.  
Blodgett's Mills, N. Y., reopened.  
Messages taken for Hensonville and Windham, N. Y., may be sent via Catskill, (as well as Rondout), "tariff for other lines" from Catskill 30 and 2.  
Boston and Springville, Erie Co., N. Y., are now W. U. Offices, in square 120. Check direct.  
Prospect House, Upper Saranac Lake, N. Y., closed.  
Paul Smith's, N. Y. closed.  
Machias, N. Y., is now a W. U. Office in square 120. Check direct.  
On and after December 1, 1875, the Utica route for messages to the Montreal offices in New York State will be discontinued, and business which is now sent via Utica will be sent and checked to Oswego. The following list includes the names of the Montreal offices referred to and also others of that company's lines to which messages may be sent via Oswego. Rate for other lines to all, 25 and 1.  
A few offices in the vicinity of Oswego will receive special instructions from their superintendent, in reference to the foregoing paragraph, which they will observe.

Adams,	East Sandy Creek,	Philadelphia,
Adams Centre,	Evan's Mills,	Pierrepont Manor,
Alexandria Bay,	Fisher's Landing,	Pleasant,
Antwerp,	Gouverneur,	Pulaski,
Belleville,	Great Bend,	Redwood,
Brownville,	Harrisville,	Rensselaer Falls,
Cape Vincent,	Henderson,	Richland,
Carthage,	Heuvelton,	Richville,
Chaumont,	La Fargeville,	Sackett's Harbor,
Clayton,	Lowville,	Sand Hill,
Constableville,	Manusville,	Sandy Creek,
Copenhagen,	Martinsburg,	Shingle Creek,
Deer River,	Mexico,	Theresa,
DeKalb Junction,	New Haven,	Three Mile Bay,
DeKalb,	Omar, Jefferson Co.	Turin,
Dexter,	Ogdensburg,	Watertown,

Port Metcalf, Ont., closed.  
Post Office Address of Manayunk, Mifflin Co., Pa., is Shank's Run.

Millerstown, Lehigh Co., Pa., changed to Macungie.  
River Trois Pistoles, Que.  
Paoli, Pa., closed.  
Overbrook, Pa., closed.  
Benson Landing, Vt. closed.  
La Para, Tex., reopened.  
Lovely, Tex., reopened.  
Elizabeth, W. Va., closed.  
122 Keyser, W. Va., reopened.

## NEW OFFICES.

304 Van Dorn, Ala.  
29 Yantic, Conn.  
337 Harriestown, Ill.  
307 Morton Grove, Cook Co., Ill., formerly Morton, Cook Co.  
407 Mt. Forrest, Ill.  
290 Becknell, Ind.  
\* Syracuse, Ind., 55 and 4 from Chicago, Ill., or 60 and 4 from Deshler, O.  
243 Paynes, Ky.  
28 Holden, Mass.  
28 Hubbardston, Mass.  
448 Ritchey, Mo.  
\* Cairo, N. Y., 30 and 2 from Catskill.  
120 Eagle Village, N. Y.  
\* East Windham, N. Y., 30 and 2 from Catskill.  
\* Leeds, " 25 and 2 "  
1 Tracadie, N. S.  
\* Charleston, Ont.  
59 Jenkinton, Pa.  
66 Macungie, Pa., formerly Millerstown, Lehigh Co.  
\* Aylwin, Que.

## ATLANTIC CABLE.

## REDUCTION IN RATES.

On and after November 6, 1875, the tariff for Atlantic Cable messages to Great Britain, Ireland, and France, will be as follows:

	For each word, IN GOLD.
From New York City, and all points in Nova Scotia, New Brunswick, and New England States.....	\$0.75
From all points in New York (except New York City), New Jersey, Pennsylvania, Delaware, Maryland, and District of Columbia.....	\$0.78
From all points in Virginia, West Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Tennessee, Kentucky, Ohio, Indiana, Illinois, Michigan, and Wisconsin, from St. Louis, Mo., and from Western Union Company's offices in Florida.....	\$0.90
From all points in Texas, Arkansas, Missouri (except St. Louis), Kansas, Nebraska, Iowa, Minnesota, Colorado, Dakota, Wyoming, New Mexico, Utah, Idaho, Montana, Nevada, California, Arizona, Oregon, and Washington Territory.....	\$0.95
British Columbia.....	\$1.10

The rates beyond London and the rules for cable messages will remain unchanged.

## CUBA CABLE.

The rates to Demerara and places south of Demerara in South America will, until further notice, be as follows:

	Ten words. GOLD.	Each additional word. GOLD.	Ten words. GOLD.	Each additional word. GOLD.
Demerara.....	17.75	1.69.....	18.75	1.79
Cayenne, S. A.....	22.75	2.18.....	23.75	2.28
Para, S. A.....	22.75	1.64.....	23.75	1.74
Pernambuco, S. A.....	27.75	2.01.....	28.75	2.11
Bahia, S. A.....	30.25	2.26.....	31.25	2.36
Rio Janeiro, S. A.....	33.15	2.55.....	34.15	2.65
Santos, S. A.....	33.15	2.55.....	34.15	2.65
St. Catherina, S. A.....	33.15	2.55.....	34.15	2.65
Rio Grande do Sul.....	33.15	2.55.....	34.15	2.65
Montevideo, S. A.....	33.15	2.55.....	34.15	2.65

For tariff to the city of Buenos Ayres and Valparaiso add the following to the rate to Montevideo.

	For twenty words or less.	Each additional ten or fraction thereof.
City of Buenos Ayres.....	\$2.16	\$1.08
Valparaiso.....	14.66	7.33

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, November 11, 1875.

On Thursday, the 25th inst., on Saturday, December 25th, and on Saturday, January 1st, office hours will be from 8 to 10 o'clock A. M., and from 4 to 6 o'clock P. M., except at repeating stations, and at principal offices, which will be kept open as usual, but with such reduction of force on duty as circumstances may permit.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, November 11, 1875.

## SPECIAL EXECUTIVE ORDER.

To all Transfer Agents W. U. Tel. Co.:

Mr. I. C. Hendrickson has been appointed Transfer Agent of this Company in place of Leonard Cox, removed.

WILLIAM ORTON,  
President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

NEW YORK, November 8, 1875.

## ASSESSMENT No. 79.

8,	51,	61,	70,	74,	76,	97,	101,	108,	112,	120,	129,	134,	154,
156,	158,	160,	164,	171,	188,	208,	218,	227,	230,	245,	248,	257,	278,
279,	280,	281,	282,	283,	285,	334,	341,	350,	353,	356,	357,	360,	362,
364,	381,	382,	398,	402,	405,	406,	411,	412,	413,	418,	425,	463,	478,
510,	511,	512,	533,	548,	561,	566,	569,	573,	574,	577,	584,	590,	597,
600,	601,	618,	642,	648,	649,	655,	659,	660,	662,	663,	664,	665,	667,
669,	678,	680,	694,	717,	723,	724,	728,	730,	733,	739,	772,	780,	790,
791,	803,	812,	820,	821,	823,	848,	870,	876,	897,	905,	927,	931,	938,
939,	942,	949,	954,	957,	959,	963,	979,	992,	995,	1005,	1030,	1031,	1033,
1034,	1038,	1046,	1050,	1056,	1058,	1063,	1069,	1072,	1101,	1139,	1190,	1210,	1211,
1233,	1234,	1237,	1238,	1241,	1248,	1267,	1268,	1269,	1270,	1288,	1290,	1292,	1294,
1307,	1309,	1311,	1312,	1313,	1314,	1315,	1317,	1318,	1319,	1320,	1321,	1222,	1336,
1353,	1364,	1355,	1356,	1372,	1376,	1406,	1415,	1428,	1438,	1439,	1457,	1458,	1482,
1483,	1484,	1481,	1500,	1515,	1532,	1537,	1542,	1546,	1560,	1578,	1580,	1596,	1601,
1605,	1607,	1608,	1625,	1634,	1637,	1639,	1652,	1655,	1658,	1660,	1661,	1662,	1665,
1667,	1676,	1678,	1684,	1687,	1688,	1692,	1695,	1696,	1709,	1710,	1713,	1714,	1724,
1728,	1732,	1745,	1765,	1766,	1767,	1787,	1788,	1789,	1795,	1796,	1797,	1804,	1823,
1824,	1835,	1837,	1838,	1839,	1840,	1841,	1844,	1845,	1857,	1858,	1859,	1860,	1863,
1863,	1874,	1877,	1889,	1911,	1913,	1914,	1934,	1943,	1946,	1951,	1953,	1954,	1968,
1978,	1992,	1993,	1997,	1999,	2000,	2001,	2005,	2010,	2012,	2022,	2027,	2028,	2033,
2035,	2036,	2041,	2045,	2053,	2065,	2072,	2074,	2075,	2092,	2108,	2119,	2120,	2123,
2125,	2131,	2136,	2137,	2142,	2145,	2156,	2157,	2167,	2175,	2183,	2184,	2185,	2187,
2191,	2192,	2195,	2196,	2211,	2220,	2225,	2230,	2231,	2233,	2234,	2237,	2238,	2245,
2246,	2252,	2254,	2254,	2263,	2271,	2273,	2280,	2291,	2292,	2301,	2304,	2323,	2327,
2340,	2341,	2342,	2350,	2357,	2361,	2366,	2368,	2369,	2394,	2401,	2416,	2419,	2423,
2426,	2429,	2435,	2437,	2443,	2446,	2452,	2462,	2466,	2473,	2476,			

## ASSESSMENT No. 78.

5,	27,	51,	237,	238,	242,	246,	258,	451,	453,	455,	457,	801,	1028,
1080,	1153,	1207,	1600,	1609,	1657,	1715,	1716,	1731,	1786,	1973,	1974,	1976,	2037,
2128,	2177,	2320,	2328,	2353,	2475,								

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

The new railroad telegraph line from Troy to Whitehall is complete.

## BRAZILIAN SUBMARINE TELEGRAPH.

The total earnings of the company for the half-year ending the 30th of June last have amounted to £68,778, and the working expenses to £11,055, leaving a balance of £57,723. To this is added £19,811, the undivided profit to the 31st of December last, making a total of £77,534. After deducting income-tax, £181, there remains a balance of £77,053. A third interim dividend, amounting to £16,250, has been distributed since the last accounts were presented, leaving £60,803, for appropriation. The directors recommend the declaration of a final dividend of 2s. 6d. per share, free of income-tax, making a total dividend of 5 per cent. for the year which will absorb £16,250, leaving a balance of £44,553. Of this amount, £40,000 has been placed to a reserve fund, the early formation and steady increase of which are at once essential to the security of the enterprise and the property of the shareholders; and £4,553 carried forward. In accordance with the general wish of the shareholders, the traffic receipts have been regularly published. Since the last meeting the lines between North and South America, Brazil and the River Plate, Lima and Valparaiso, have been opened. The company's cables are in order, although a slight fault has developed itself in the Madeira-St. Vincent section. This, however, has not interfered with the efficiency of the line, the traffic continuing to be conducted with rapidity and regularity. The submarine telegraph companies represented at the St. Petersburg Conference having adopted the system of charging for each single word in extra-European messages, the change over this company's line will come into operation on the 1st of January, 1876.

## DIRECT SPANISH TELEGRAPH.

The accounts for the half-year ending 30th June last showed a balance to the credit of profit and loss of £6,118. The traffic since the 30th of June, 1875, up to this date, showed a satisfactory increase over the first three months of last half-year, and a very large increase over the corresponding three months of 1874. The balance at the credit of profit and loss was sufficient to pay, after providing for the 10 per cent. preference dividend, a dividend at the rate of 5 per cent. per annum on the ordinary shares, leaving a balance of £429; but, inasmuch as the half-year ending the 30th of June was commenced with a reserve fund of £703, (since absorbed in the repairs of the Santander cable), the directors deemed it prudent to recommend a dividend at the rate of 4 per cent. per annum on the ordinary shares, and to replace the sum of £704, together with a further sum of £307 to the credit of the reserve fund, so as to begin the current half-year with a total reserve of £1,011.

The Eastern Telegraph Company, in connection with the Eastern Extension, Australasia and China and Brazilian Submarine Telegraph Companies state in their circular for the month of September last the latest dates of messages received in London from India, China, Australia, etc., by the direct cable route of the Associated Companies, which continued working with uniform speed and efficiency, that the average time the messages occupied in transit had been from Calcutta seventy minutes, and from Bombay fifty-five minutes. The Eastern Extension Company's Cable between Singapore and Batavia had been restored, having been interrupted for repairs during the first half of the month. The Indian Government lines between Ahmedabad and Deesa were swept away by floods, and all communication with India and the East (excepting to Kurrachee) by

the land route was in consequence interrupted from the 20th to the 28th of September, between which dates the whole of the Indian traffic passed over this company's lines.

The liquidator of the Panama and South Pacific Telegraph Company announces that all the moneys owing to the company having been collected, he is enabled to declare a further return of 15s. 9d. per share to those shareholders who have paid up £2 10s. per share, and a return of 7s. 2d. per share to those who have paid only £1 per share, being the proportion due to them after deducting interest at the rate of 5 per cent. on the allotment money due the 31st January, 1870, not paid by them.

At a meeting of the Board of the West India and Panama Telegraph Company it was resolved to recommend to the shareholders, at the approaching general meeting, the declaration of a dividend of 7s. 6d. per share, on account of arrears of dividend on first preference shares to 30th of June, 1875.

Since the nomination of Yaver Pacha as Director of the Telegraph and Postal Department of Turkey, and Mr. Scudamore's arrival at Constantinople, the postal and telegraphic administrations have displayed great activity.

The traffic receipts of the Western and Brazilian Telegraph, for the five weeks ending October 1st, £10,360, showing an increase of £1,124 over the corresponding period of last year.

The traffic receipts of the Direct Spanish Telegraph, for the month of September, 1875, £1,547, against £1,245 in the corresponding period of last year.

The directors of the Eastern Extension, Australasia and China Telegraph Company have declared an interim dividend for the quarter ending June 30th, 1875, of 8s. per share, or at the rate of 6 per cent. per annum, free of income tax, and payable October 15.

The traffic receipts of the Brazilian Submarine Telegraph, for the month of September, 1875, £9,544, as against £8,238 for the corresponding period of 1874.

## UNITED STATES AND MEXICAN TELEGRAPH.

The President and directors of this company having made a formal application to have the company dissolved, the New York Supreme Court has appointed Robert J. Livingston, Receiver, to take charge of the company's property and wind up its affairs. He gives notice that all persons owing the company money, or holding any of its property, must pay or restore the same to him by Nov. 27th, and all claims against it must be presented to him at the office of L. L. Delafield, No. 49 Exchange Place, New York, also by Nov. 27.

## TELEGRAPHIC DIFFERENCES OF LONGITUDE.

The United States steamer Gettysburg has left Washington to continue the work commenced last year by Lieutenant Commander Green in the Fortune, of determining telegraphic differences of longitude with the West Indies, and verifying previous deep sea soundings and surveys at various points in the West Indies. She will visit Norfolk, Key West, Kingston, Jamaica; Porto Rico, Barbadoes, St. Thomas, and places on the San Domingo coast.

## INFORMATION WANTED.

Miss Ellen Vinton, Marion, Marion Co., Ohio, would thankfully receive any information of Charles A. Kernan, formerly telegraph operator at Garnet, Kansas.

## MAGNETISATION OF ILMENITE (TITANIC IRONSTONE).

BY DR. T. L. PHIPSON.

Some fine specimens of ilmenite having been sent to my laboratory from Norway, it seemed a good opportunity to investigate the magnetic properties of this mineral. The composition of that which served in my experiments was:—

Titanic acid	24.60
Protoxide of iron	72.10
FeS <sub>2</sub>	2.06
Manganese	trace
Silicic acid	1.24

100.000

Its sp. gr. was 4.8, and it acted with tolerable energy upon the magnetic needle. From the inspection of this action I concluded that it was possessed of a very considerable number of poles in close proximity to each other, so that scarcely two closely adjacent parts acted in the same manner upon the north pole of the needle; hence it was evidently built up by a mass of crystals. An elongated rectangular piece of this mineral was separated by a blow of the hammer; it measured 1½ ins. in length and was about ½ in. broad. This was placed upon a table and submitted to magnetisation by friction with good magnets for upwards of an hour. It was then found to have a pole at each extremity, which it certainly had not before, and was accordingly suspended to a piece of silk, and hung up in a quiet corner of the laboratory. It pointed constantly toward the north, and returned to that position when deviated. It continued to do so for some weeks; but one morning I found it pointing east-west, or nearly so; it had lost its acquired magnetism entirely, having retained it for rather more than a month. This loss occurred rather suddenly, and I am of opinion that it coincided with a magnetic storm of some intensity which happened about the time. If these experiments could be continued by some who have more time to devote to them, they might lead to some interesting results. It is possible that some minerals that show no action upon the needle might be made magnetic in the above manner.

## CURIOUS STATISTICAL TABLE.

A curious statistical table has been drawn up in France showing the distribution of letters and telegrams per head in different countries. Switzerland is first in both classes, the telegrams averaging eight for every one hundred inhabitants, in France there are twenty-three letters to every one hundred inhabitants, in England twenty and one-twelfth, and in the United States nineteen. In England there are fifty-four telegrams for every one hundred inhabitants, in Holland fifty-one, in Belgium forty-seven, in the United States thirty-two, in Germany thirty-one, France ranks tenth, and Russia last, with one.

## BORN.

WAGGONER—At Conneaut, Ohio, October 29, 1875, a son to A. P. Waggoner, manager W. U. Tel. office.

WOODSON—At Mumfordsville, Ky., October 23, 1875, a daughter, to W. E. Woodson, formerly operator and agent at Rocky Hill, Ky.

## MARRIED.

SHEARER-GILLESPIE—At Auburn, Cal., October 3, 1875, B. C. Shearer, night manager W. U. Tel. office at Sacramento, to Miss E. M. Gillespie, of Yankee Jim's, Cal.

## DIED.

RICHARDSON—At Greensburg, Ky., Aug. 16, 1875, of diphtheria Beulah Lee, aged 6 years and 2 weeks. Also at same place and of same disease, Aug. 27, Annie, aged 6 months, daughters and only children of James F. Richardson, manager W. U. Tel. office, Columbus, Ky.



## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

### TERMS:

**TWO DOLLARS PER ANNUM IN ADVANCE.**

Address—

JOURNAL OF THE TELEGRAPH,

Western Union Telegraph Company.

195 Broadway, New York.

NEW YORK, NOVEMBER 15, 1875.

### HOLIDAY ARRANGEMENT OF HOURS.

Office hours on Thanksgiving, Christmas and New Year's days, are from 8 to 10 A. M., and from 4 to 6 P. M., except at repeating stations, and at the principal offices, which are to be kept open as usual, but with such reduction of force as may be warranted by circumstances. See Executive Order on page 342.

### REDUCTION IN CABLE RATES.

On Saturday, Nov. 6th, the word rate by cable from New York to Great Britain, Ireland and France was reduced from one dollar to seventy five cents in gold. From other parts of the United States a proportionate reduction took place. For particulars see the Tariff Circular on Page 342.

### THE DIRECT CABLE REPAIRED.

The break in the Direct United States Cable was repaired by the Steamer *Faraday* on Thursday, Nov. 4th. It was found in 70 fathoms of water and was apparently caused by an anchor or a grapnel.

### ARRIVAL OF THE PROFESSOR MORSE.

The International Ocean Telegraph Company's Steamer *Professor Morse* arrived at this port on Monday, Nov. 8th, from Key West, having completed the laying of the new cable between Key West and Punta Rassa, and repaired and restored the old cable which had been interrupted for some time.

### THE ASSOCIATION MEETING.

There was a large number of members present at the annual meeting of the Telegraphers' Mutual Benefit Association, held on Wednesday last, it being the largest gathering which has as yet taken place. The proceedings were harmonious and enthusiastic, and will be found in detail in another part of this paper.

On Thursday, the out-of-town delegates called in a body on President Orton and other executive officers of the Western Union Company, for the purpose of paying their respects, and were highly pleased with their reception.

### A MISERABLE FRAUD.

We print herewith a circular which has evidently been sent to every place in the country at which a telegraph operator is located, a number of them from points widely separate having been forwarded to this office for information.

Our correspondents rightly regard the proposition contained as insulting alike to their intelligence and integrity. They ask, and it accords with the desire of the JOURNAL, that a note of warning be sounded to those who may be in danger of being led astray by the apparent plausibility of the scheme, and we do so in the plainest language at our command. The following is the circular.

BUCKWALTER & CO.,  
BANKERS AND BROKERS,  
No. 10 Wall Street,  
New York, October 15, 1875.

"Operator" Western Union Telegraph Co.

DEAR SIR—Enclosed herewith please find a copy of our Weekly Financial Report of the Stock Market, which gives highest and lowest prices of stocks since 1867, together with the different modes of operating in stocks and "stock privileges;" also, one blank for daily quotations of stocks—we propose to furnish you with such an amount of the blanks as you can use FREE, and, in addition thereto, will allow you one-half of our commissions for any business that you may send us; will also mail you a copy of our weekly report FREE. If you think favorable of our proposition you can at once advise us, naming the number of blanks required each month, and they will be forwarded to you at once.

We are, very respectfully,

BUCKWALTER & CO.

Now there is nothing in this circular alone to excite distrust. It appears to be only a business offer based upon interests to be made mutual. But when considered with the "Weekly Report" which accompanies the circular, the insidious and vile character of the proposition becomes plain. Nothing can be more evident that in these transactions the gain of one involves loss to another, and it is equally certain that the losses invariably fall upon parties of small capital, or margin risked. And yet there is a reassuring element in the prospectus; it is carefully observed that loss is limited to the amount actually put up. In other words after obtaining possession of a man's coat he is not to be stripped of his shirt. It is, however, a cause for wonder that parties so reasonably sure to win fortunes for others, at so trifling a risk, do not make these successful ventures for themselves, and thus, in making a living, be no longer necessitated to tempt poor human nature to folly, if not to crime. We do not propose to enter into a dissertation upon the evils of gambling, which we regard as essentially dangerous to moral character but we cannot help viewing this attempt to beguile and corrupt the telegraph operators of the country in the same light that we would a proposition to spread abroad the germs of an infectious disease.

As to the insult involved in the assumption that telegraph operators are ready and willing to act the part of "stool-pigeons" or "ropers-in," characters always to be found wherever a gambling hell exists, we can say but little which will add to the just indignation felt at so gross an affront. A person of good instincts and of ordinary judgment needs no advice as to the manner in which such an offer should be met. We should state, however, that in all times and with all classes of society, such characters

have been held to be outside the pale of decency, and nothing is more fiercely resented, even by the most hardened ruffian, than an insinuation that he would mislead a friend or confidant to loss or ruin. And yet this is what the proposition contained in the circular amounts to. An operator is desired to "rope-in" his friends and acquaintances and as an inducement is offered a share in the spoil.

In conclusion it seems hardly necessary to say that this miserable fraud resembles in no sense (except in the commodities dealt in) the respectable and reputable business of buying and selling stocks and bonds as conducted by honorable men. With this understanding we trust that we have been sufficiently explicit in our warning and hope that it will serve to avert the certain loss and possible ruin which would surely follow any indulgence in schemes so delusive and so essentially wicked.

### THE QUADRUPLEX.

We publish in this number of the JOURNAL a paper by Mr. Pope on the subject of quadruplex telegraphy, which gives a very complete and accurate historical sketch of its origin and development, together with a description of the system as now practically operated on the lines of the Western Union Telegraph Company. Mr. Pope's careful exposition of the whole subject shows conclusively that what is commonly called the quadruplex system consists in fact of two separate and entirely distinct inventions, viz. a new method of simultaneous double transmission in the same direction, and some one of Stearns's methods of simultaneous transmission in opposite directions. As the latter forms no less an essential part of the quadruplex apparatus than the former, it is evident that even a practical and successful method of double transmission in the same direction could not legally be employed in conjunction with either of Mr. Stearns's duplex methods in any of the various countries in which the latter have been patented, except by the consent of the owners of these patents.

### KEEPING BATTERIES CLEAN.

A recent invention of a battery table fitted with appliances to catch the overflow or drip from the cells, affords an opportunity to call the attention of managers of offices to the fact that there must be a sad lack of care on their part to give rise to the necessity for such an invention. A battery room should be perfectly clean and dry and in well-conducted offices this is always the case. In offices where the condition is the reverse of this, a better reason exists for a change in the management than for the adoption of any drip catching contrivance.

As an illustration of the way in which batteries should be kept the battery department of the New York office affords an excellent example. In this room there are nearly 11,000 cells in use. The cups are placed upon slats in tiers. The floor is as clean as a well kept kitchen and there is not a particle of moisture upon it or on the battery supports. Four



men keep everything in perfect order. What can be done here can be done in all other offices.

Managers should look after their battery rooms as carefully as their operating rooms, and the superintendent should personally inspect them as frequently as is practicable.

### TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

#### ANNUAL MEETING.

The annual meeting of the Telegraphers' Mutual Benefit Association, was held in the Western Union Telegraph Building at 7:30 p. m., Wednesday, November 10th. A large delegation was present. Mr. J. W. Tillinghast of Buffalo, was appointed Chairman, and Mr. William Holmes, of New York, Secretary. The following are the reports of the officers:

#### REPORT OF THE SECRETARY.

During the year ending to-day, there have been eight deaths of members, viz.—

E. S. Springsteen of New York.  
John Stalcup of Washington.  
Wm. F. Muchmore of Astoria, L. I.  
Wm. Lee Allen of Key West, Fla.  
Walter M. Tenny of Toronto, Ont.  
John Trevor of Rochester, N. Y.  
Abraham Kern of Cincinnati, Ohio.  
Charles H. Vawter of Sumner, Ill.

The number of new members admitted was 174, and the number dropped from the roll 111. Present membership roll contains 1269 names. Forty-two applications for readmission to membership were made during the year, all but three of which were accepted. Eleven of the applicants were in arrears for less than \$5 each. The remaining twenty-eight paid the \$5 for back assessments required by By-Law II.

In the first year of the association, when its members numbered less than 350 there were but two deaths, a ratio of 1 to 175.

In the second 8, the membership 652, a ratio of 1 to 81  
" third, 7, " 700, " 1 to 100  
" fourth, 7, " 758, " 1 to 108  
" fifth, 11, " 958, " 1 to 87  
" sixth, 19, " 1,230, " 1 to 65  
" sev'th, 18, " 1,206, " 1 to 67  
" eighth, 8, " 1,268, " 1 to 158

#### FINANCES.

Balance Nov. 11, 1874.....	\$9,515 95
Received assessments.....	13,106 16
" applications.....	174 00
" Gift W. U. T. Co.....	1,000 00
" Sale of desk.....	15 00
" interest on investments.....	350 00
" " on deposits.....	238 60
" Profits on sale of bonds.....	15 00
Total.....	24,414 71

Of this amount there has been paid the following:

Heirs of A. R. Walsh.....	\$1,000 00
" T. A. English (to balance).....	850 00
" J. B. Dillon (to balance).....	850 00
" C. B. Mathews (to balance).....	850 00
" A. G. Martin.....	1,000 00
" V. A. Shea (to balance).....	900 00
" E. B. McDill.....	1,000 00
" W. C. Havens.....	1,000 00
" E. S. Springsteen.....	1,000 00
" John Stalcup.....	1,000 00
" W. F. Muchmore.....	1,000 00
" W. L. Allen.....	1,000 00
" W. M. Tenny.....	1,000 00
" John Trevor.....	1,000 00
Paid Secretary's Salary.....	500 00
Paid for printing.....	206 85
Paid for postage.....	179 58
Refunded.....	25 50
Due heirs of Abraham Kern and C. H. Vawter.....	2,000 00
Total.....	16,361 93
Leaving a reserve fund of.....	8,052 78

Of this fund \$6,868 75 were expended in the purchase of bonds drawing interest at seven per cent. on \$7,000. The balance, \$1,137.38, with the \$2,000 due the heirs of Kern and Vawter, is on deposit with

the Treasurer of the W. U. Tel. Co., leaving \$46.65 cash on hand.

WILLIAM HOLMES,  
Secretary.

#### TREASURER'S REPORT.

The past year has been one in every way remarkable. Scarcely had the delegates reached their homes before a gift as generous as it was unexpected was received from the President of the Western Union Telegraph Co., in testimony of that Company's appreciation of the value of your association. It was a gift of one thousand dollars. I have called it generous, but would be justified in calling it wise. The moral power and influence of an organization like yours based on those finer feelings of the heart which project themselves beyond life and seek to provide for others when its members are dead, an organization working quietly yet persistently year by year inside a vast corporation such as the Western Union Telegraph Co. has become, cannot but give to its administration somewhat of its own pulse and genius. Kindness I regard as one of the highest forms of power. This Association has its foundation in two great facts. First, that death is certain; second, that death not only puts out the light of a human life, but leaves tears and sorrow and often want behind it. You organized yourselves to take from death part of his triumphs by removing the want which extinguishes hope and deepens sorrow into anguish. And in doing all this you were building up, perhaps unconsciously, a great circle of moral power the value of which as a factor in administration of a great public trust may well be recognized by a thoughtful executive as one of no mean proportions. I believe the gift had this intelligent significance. The men who are true to themselves are the men on whom corporations can best rely. Not only so, our organization had sustained a loss by the brave sacrifice of one of its members to zeal for the Company who made this gift. Saville left his healthy home and perished at Shreveport a sacrifice to his gallantry in the Company's service, which the Company appreciated and justly honored. There was something, therefore, of the generosity of justice in restoring what that heroic death cost us. Viewed thus it only adds to its meaning and value.

Immediately on receiving this gift the Executive Committee met, and finding that the reserve fund approximated \$4,000, and that funds on hand not yet payable could be used to make, with the gift, \$5,000, ordered the investment of that sum in 7 per cent. bonds, which was at once done. Since that time the surplus fund has increased so much that \$2,000 more have since been similarly invested, and a balance yet remains as a cash fund of \$1,137.38, a most gratifying condition surely in which to meet at our annual gathering to-night.

Another gratifying fact has been the very limited number of deaths during the year. Of the eight which have occurred since your last annual meeting two were violent; one by accident, C. H. Vawter of Sumner, Ills.; the other, John Trevor, of Rochester, by murder while performing his duty. One death has occurred which the Executive Committee decline to provide for. This was the case of C. B. Schultz, of Moniteau, Mo., who had been a member only thirty days when he died, and of whom it seems evident that the application was false. The case is left to your action, should you deem it best to examine it and order action therein. Another claim awaits settlement. Abraham Kern, of Cincinnati, made his mother his heir. She died before him, but he made no change in the heirship. The brothers claim the money, but it is withheld until an order of a competent court decides their right to it.

The efficiency of the Association and the small death rate are greatly due to the increased carefulness and intelligent attention of the agents who have, without exception, very faithfully attended, without compensation, to the laborious duties devolving upon them.

I beg to raise the question whether a member allowing himself to fall into habits of notorious intoxication should not, on the appeal of two members, be liable to be dropped from membership.

I also suggest the propriety of declaring a dividend to members of long standing as the funds may justify after the maximum surplus has been reached. Something seems due to those who, for a certain term of years, have steadily paid their dues. Perhaps after another year some plan having this in view may be devised.

I recommend that on our next annual gathering arrangements be made for a dinner at some suitable place where the delegates and the New York members can meet each other on familiar terms, and where good speakers and good music may make the occasion one of cheerfulness and animation.

I have only to add a word of gratitude for the success of the year, and the hope that we may all meet again as happy as now when another year has closed upon us. Never has the Association had so reliable a membership, or had opened to it so fair a promise of prosperity and usefulness.

JAMES D. REID,  
Treasurer.

After the reading of the report, Mr. Loesch, of Chicago, was appointed a committee to investigate personally the case of C. B. Schultz at Moniteau Mo.

On motion of Mr. Loesch, of Chicago, it was

*Resolved*—That all members are earnestly requested to make their remittances for assessments and other purposes through the agent nearest them.

It was thought that this would lead to a more perfect representation of the association at the annual meeting, and to a closer fraternization of the members. By a system of districts, the members could occasionally hold meetings among each other, and discuss points of interest as these might arise.

The election of officers and Executive committee resulted as follows:

JAMES D. REID, Treasurer.  
WILLIAM HOLMES, Secretary.

#### Executive Committee.

JOHN B. VAN EVERY, T. G. SINGLETON, W. A. SCHRAM, C. H. SUMMERS, of Chicago, and J. M. CROWLEY, of Augusta, Ga.

On motion of Mr. John Fuller, of Easton, it was

*Resolved*—That the salary of the Treasurer be two hundred and fifty dollars per year.

On motion it was

*Resolved*—That a committee of three be appointed by the chair to examine the Treasurer's account and publish in the JOURNAL OF THE TELEGRAPH a statement of the surplus on hand and how invested.

Messrs. S. B. Gifford, John Fuller, and T. P. Scully, were appointed such committee.

After which the meeting adjourned.

#### GEOGRAPHICAL SCIENCE CONGRESS.

The International Congress for the advancement of Geographical Science has lately concluded its second session, and the list of prizes granted by the international jury has been published in Paris. Among the honors awarded to the United States is a medal of the second class to the members of the Tuscarora Expedition for their deep sea soundings in the Pacific Ocean, and the Signal Service receive well deserved letters of distinction.



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Sells rapidly. Money in it. Send 25 cents for samples.  
Gross, \$7.00. Quarter Gross, \$1.75. Agents wanted.

GEO. W. FLAGG, Newport, R. I.

THE undersigned is prepared to contract for the prompt delivery of TELEGRAPH POLES of any size and quality.

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CONTRACTOR AND BUILDER,  
No. 111 Liberty Street, New York.

**A Great Reduction in Prices.**

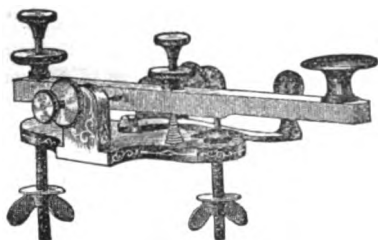
I am now making a specialty of my PHIL. SHERIDAN SOUNDER AND KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



PHIL. SHERIDAN, \$4.00.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. Extra.



PHIL. SHERIDAN KEY, PRICE, \$2.00.

You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, etc., etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Calland Battery, 1 lb. Blue Vitrol, Connection Wire, Book of Instruction, etc., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

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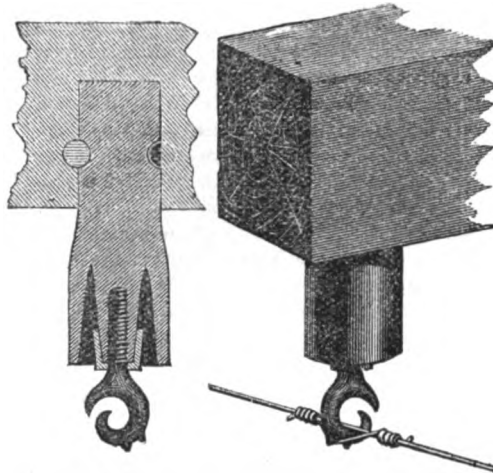
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are invited to examine the merits of our new and improved  
patterns of

**KENOSHA CARBON INSULATORS!**

These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellent of moisture, which does not change nor deteriorate after years of exposure to the weather.

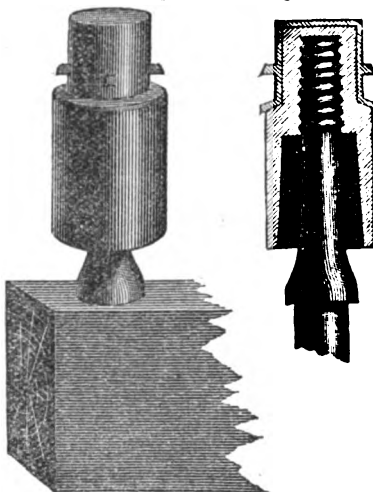
THE KENOSHA INSULATOR has now stood the test of SIX YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average, MORE THAN TEN TIMES AS GREAT

luring the prevalence of rain or fog.  
Immense numbers of these Insulators are in use by  
The North Western Telegraph Co.,

The Western Union Telegraph Co.,  
as well as many RAILWAY and OTHER TELEGRAPH LINES,  
and they have invariably been found to give

**ENTIRE SATISFACTION.**

Besides the Suspension Insulator above shown, which is fitted with our IMPROVED WIRE HOLDER, arranged for a tie wire, which does not cramp or injure the line wire, we manufacture several other patterns, among which is the



CAP INSULATOR, WITH PIN OR BRACKET,  
which is fitted with a zinc protection, as shown in the above figure,

**THE KENOSHA INSULATOR**

is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

We are also prepared to furnish, at short notice,

CROSS-ARMS for any REQUIRED NUMBER OF WIRES,  
prepared with our Patent INDESTRUCTIBLE INSULATING COATING, either with or without wire insulators.  
These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all insulators furnished by us to prove entirely satisfactory.

THE KENOSHA INSULATOR CO.,  
KENOSHA, WIS.

L. G. TILLOTSON & CO.,  
8 Dey St., New York,

GENERAL EASTERN AGENTS.

THE WESTERN ELECTRIC MFG. CO., of Chicago,  
GENERAL WESTERN AGENTS.

WANTED—BY YOUNG MAN, A FAIR OPERATOR, PLACE with some western Railroad Agent where he could earn his board and learn Railroad business; best of references furnished. Address, OPERATOR, Drawer 70, Janesville, Wis.

\$5 to \$20 per day at home. Samples worth \$1 free.  
BRINSON & Co., Portland, Maine.

**OPERATORS' CHANCE!**

Electrotype Cards, of Keys, Sounders, Relays, etc., with your name, handsomely printed on 25 assorted cards, for 25 cents, or 75 with name, business, etc. for 50 cents. Also R. R. Cards, samples of Electrotype Cards 3 cents. Agents allowed 25 per cent. to take orders for the finest and largest assortment of fashionable Visiting Cards, with Circulars, etc. mailed for 25 cents.  
Address, F. P. MUNN,  
Clyde, Wayne County, N. Y.

**ORTON'S****PATENT PENCIL HOLDER.**

This Holder is intended to save the last half or third of the pencil.

**DIRECTIONS:**

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

Price 25 cents each. Sent by mail on receipt of price.

Price per dozen, . . . . . 2.50.

GEO. H. BLISS & CO.,

CHICAGO, ILL.

**EUGENE F. PHILLIPS,**

MANUFACTURER OF

**REED & PHILLIPS' PATENT INSULATED TELEGRAPH WIRE,**

PATENT RUBBER-COVERED WIRE,

PATENT ELECTRIC-CORDAGE, CABLES, etc., etc.

No. 20 CONDUIT STREET,

PROVIDENCE, R. I.

**THE LECLANCHE BATTERY.**

(PATENTED.)



This is the ONLY one which which is perfectly suitable for all open circuit work such as Electric Bell ringing, hotel and house annunciators, burglar alarms, signals, laboratory experiments, etc., or wherever a battery is wanted which is clean, free from acids, always ready for use, and does not consume when not in operation.

IT LASTS, WITHOUT RENEWAL, from SIX MONTHS to SEVERAL YEARS, according to use.

IT DOES NOT FREEZE, EMITS NO ODOR WHATEVER, and

DOES NOT GET OUT OF ORDER.

For these reasons it is the only suitable and SAFE battery FOR BELLS, etc., in Private Houses where the Battery MUST BE CLEAN, RELIABLE, and always ready for use.

The electro-motive power of Grove being 100, this is 75, and Daniells 50; or three cells of this battery are equal to four cells of the Daniells.

Liberal discounts to the trade. For circulars, prices, etc., send to

The LECLANCHE Battery Co.  
No. 40 West 18th Street.

Or to L. G. TILLOTSON & CO.,

Sole Agents,

No. 8 Dey Street.

PHILADELPHIA: 54 South Fourth Street.



## AMERICAN FIRE ALARM.

AND  
POLICE TELEGRAPH.GAMEWELL & CO., PROPRIETORS.  
NO. 62 BROADWAY, NEW YORK.

J. W. STOVER, General Agent and Superintendent.  
L. B. FIRMAN, Chicago, Ill.  
General Agent for the West and Northwest.  
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L. M. MONROE, New Canaan, Conn.,  
Special Agent for New England.

ELECTRICAL CONSTRUCTION & MAINTENANCE CO.,  
San Francisco, Cal., Special Agents for California, Oregon  
and Nevada.

This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

## AUTOMATIC PLAN,

is now in operation in the following cities, to which reference is made for evidence of its great SUPERIORITY, VALUE and UNIFORM RELIABILITY;

Albany, N. Y.	New Orleans, La.
Alleghany, Pa.	New Haven, Conn.
Boston, Mass.	Newark, N. J.
Buffalo, N. Y.	Omaha, Nebraska.
Baltimore, Md.	Philadelphia, Pa.
Chicago, Ill.	Pittsburg, Pa.
Cincinnati, Ohio.	Portland, Me.
Columbus, Ohio.	Peoria, Ill.
Cambridge, Mass.	Providence, R. I.
Charlestown, Mass.	Quebec, L. I.
Covington, Ky.	Rochester, N. Y.
Detroit, Mich.	Richmond, Va.
Dayton, Ohio.	Indianapolis, Ind.
Elizabeth, N. J.	St. Louis, Mo.
Fall River, Mass.	St. John, N. B.
Fitchburg, Mass.	Springfield, Mass.
Hartford, Conn.	San Francisco, Cal.
Jersey City, N. J.	Savannah, Ga.
Louisville, Ky.	Syracuse, N. Y.
Lawrence, Mass.	Troy, N. Y.
Mobile, Ala.	Toledo, Ohio.
Montreal, Canada.	Toronto, Canada.
Milwaukee, Wis.	Washington, D. C.]
New York City.	Worcester, Mass.
Lynn, Mass.	New Bedford, Mass.
Lowell, Mass.	Bridgeport, Conn.

The distinctive features of these systems of

## FIRE ALARM AND POLICE TELEGRAPHS

## ARE

First—The AUTOMATIC SIGNAL BOXES, the simple electro-mechanism of which enables anyone—even a child—to give an instantaneous, general and definite alarm of fire.

Second—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchmen.

Third—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

Fourth—The ELECTRO-MECHANICAL GONG STRIKER, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

These features combined form the

ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM

## OF

## FIRE ALARM TELEGRAPH IN THE WORLD.

Messrs. GAMEWELL & CO. are the owners of the original FARMER AND CHANNING PATENTS, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

## MORE THAN TWENTY PATENTS,

The introduction and operation of the AUTOMATIC SYSTEM involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

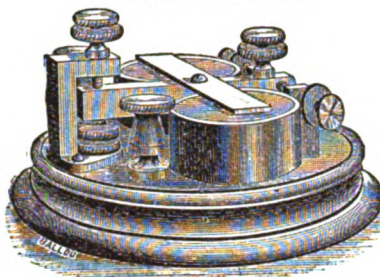
The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

## LITTLE MONITOR

Improved.



PRICE, \$6.00.

THE FINEST SOUNDER MADE.

THOUSANDS IN USE.

THEY SELL THEMSELVES.

Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful little Sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. PRICE, \$4.00.

No cast or malleable iron used in these instruments.

Sounder and Key, together. \$9.00.

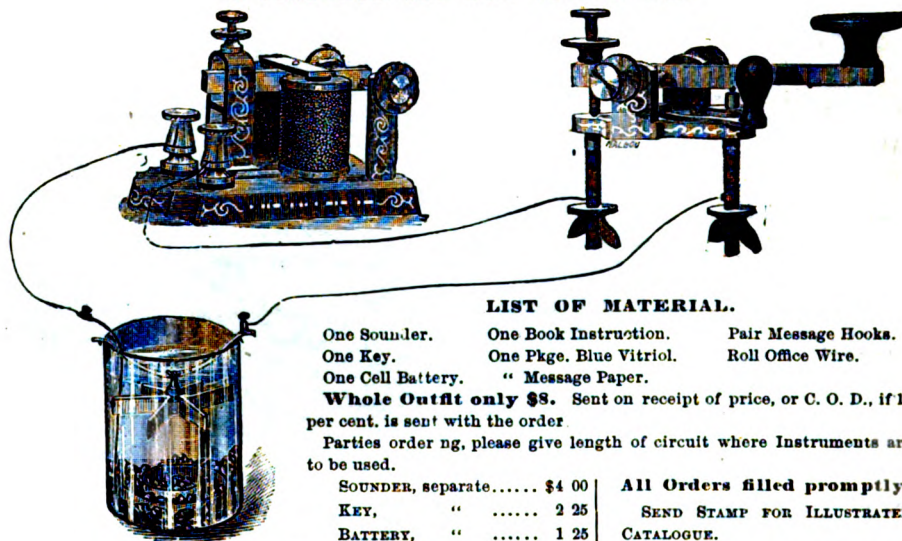
Orders filled promptly and sent on receipt of price, or C. O. D., if 10 per cent. accompanies the order.

M. A. Buell &amp; Sons,

86 Bank Street, Cleveland, O.

## THE EUREKA INSTRUMENT.

A COMPLETE SET FOR OFFICE USE.



## LIST OF MATERIAL.

One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
One Cell Battery.	" Message Paper.	

Whole Outfit only \$8. Sent on receipt of price, or C. O. D., if 10 per cent. is sent with the order.

Parties ordering, please give length of circuit where Instruments are to be used.

SOUNDER, separate.....	\$4 00	All Orders filled promptly.
KEY, " .....	2 25	SEND STAMP FOR ILLUSTRATED
BATTERY, " .....	1 25	CATALOGUE.

M. A. BUELL &amp; SONS, 86 Bank St., Cleveland, O.

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104 CENTRE STREET, N. Y.,

TELEGRAPH ENGINEER,

And Manufacturer of

INSTRUMENTS, BATTERIES,

AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES. Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extend of their Business, domestic and foreign, enabling them to keep pace with telegraphic progress. They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

## CALLAUD BATTERY,

KEPT ON HAND

AND

Orders filled by

W. MITCHELL McALLISTER,

728 Chestnut Street, Philadelphia.

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AND BY

The Western Electric Manuf. Co.

Agents for the United States.

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## AMERICAN LINE.

Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

CALLING AT QUEENSTOWN,

Sailing every Thursday from Philadelphia, and  
Sailing every Wednesday from Liverpool.  
The following Steamers are appointed to sail from Philadelphia.

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PRICES OF PASSAGE IN CURRENCY.

Cabin, \$100.

Steerage and intermediate tickets to and from all points at the lowest rates.

Steamers marked with a STAR do not carry intermediate, Passenger accommodations for all classes unsurpassed. For passage, rates of freight and other information apply to

PETER WRIGHT & SONS, General Agents,  
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## Red Star Line.

Appointed to carry the Belgian and United States Mail.  
The following Steamers are appointed to sail

FOR ANTWERP.

From Philadelphia.

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FROM ANTWERP.

For Philadelphia.

For New York.

NEDERLAND.....Nov. 29	SWITZERLAND.....Nov. 17
VADERLAND.....Dec. 23	STATE OF NEVADA.....Dec. 11

PRICES OF PASSAGE IN CURRENCY.

First Cabin, - - - \$90. Second Cabin, - - - \$60

Steerage tickets to and from all points at the lowest rates. Passenger accommodations for all classes unsurpassed.

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Manufacturers and Dealers in Electrical Goods and Apparatus,

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Our facilities for the Manufacture of Electrical Apparatus are unrivalled.

We invite correspondence and solicit Patronage.

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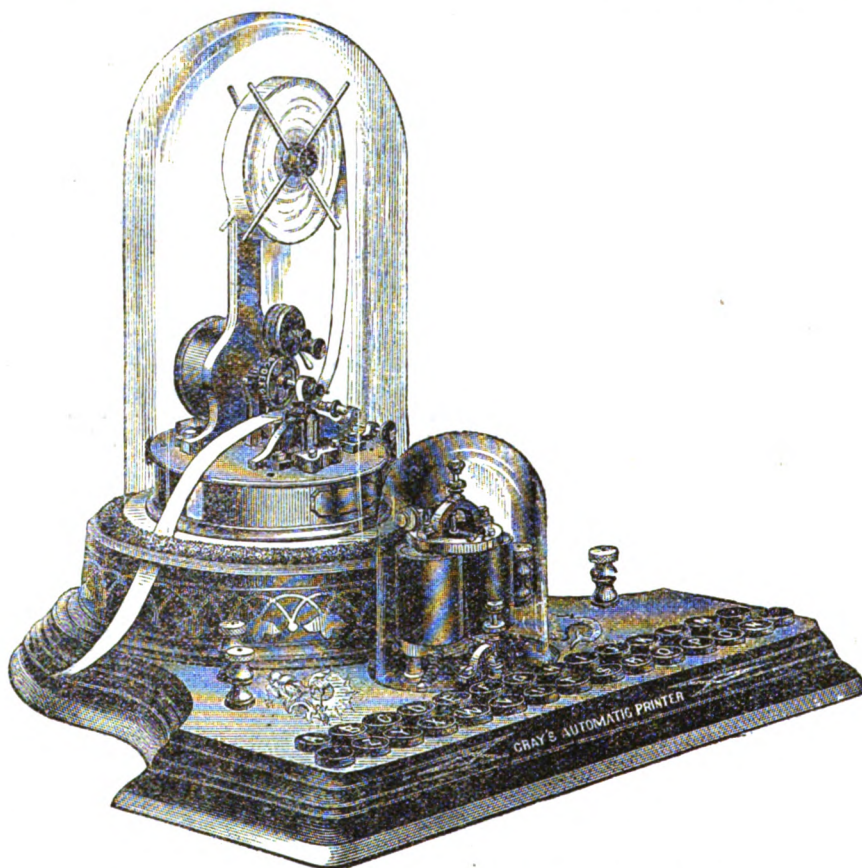
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## MERCURIAL FIRE ALARMS.

CABLES,

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This Company furnish  
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GENERAL COMMERCIAL NEWS REPORTS

To its Subscribers,  
By Telegraphic Printing Instruments,  
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As manufacturers of all the perfect TELEGRAPHIC PRINTING INSTRUMENTS in use, and owners of a large number of Patents, we are prepared, under the facilities of our contracts with the WESTERN UNION TELEGRAPH CO., to extend our system of COMMERCIAL REPORTS and PRIVATE LINES to all parts of the UNITED STATES.

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**GLASS NEW-YEAR CARDS**

Six transparent colors, beautiful designs.  
Your name handsomely printed in gold on  
1 doz. for 50 cts., post paid; 3 doz. \$1. Samples 10 cts. Agents wanted  
everywhere. Outfit 25 cts. F. E. SMITH & CO., Bangor, Me.

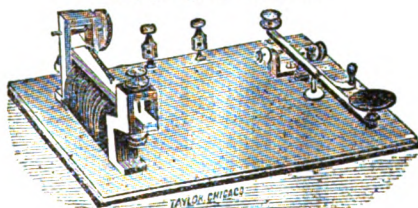
\$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

**THE AMATEUR  
Telegraph Apparatus**

Comprises SOUNDER, KEY CUP OF BATTERY, CHEMICALS, WIRE AND MANUAL.

Several thousand of these instruments already sold,

They give good satisfaction.

**PRICES:**

AMATEUR OUTFIT, COMPLETE, No. 1, - - -	\$7 50
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" SOUNDER AND KEY, No. 1, - - -	6 50
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" BATTERY, PER CELL, - - -	65

**DISCOUNTS.**

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

**GEO. H. BLISS & CO.,**  
220 KINZIE STREET,  
CHICAGO, ILL.

**BUNNELL'S  
NEW GIANT SOUNDERS PERFECTED.**

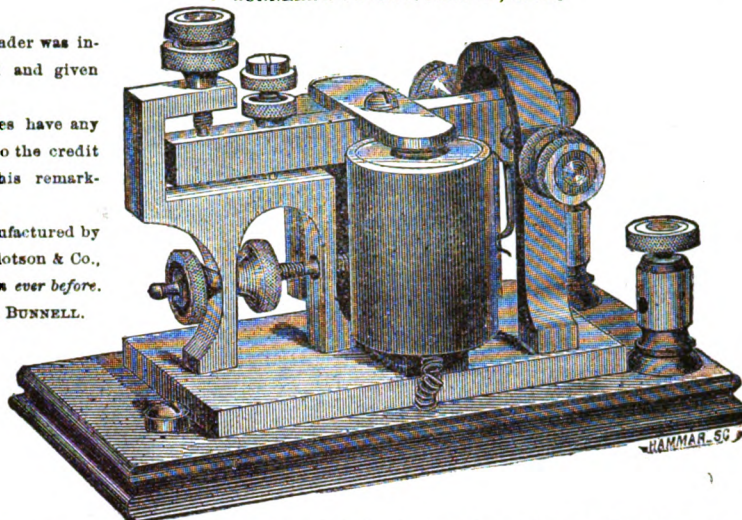
BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was invented, patented and given its name by me.

No other parties have any claim whatever to the credit of originating this remarkable instrument.

It is being manufactured by Messrs. L. G. Tillotson & Co., more perfectly than ever before.

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable and substantial shape.

They give enormous sound with but little Local Battery power. Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder is desired.

**PRICE, \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

**L. G. TILLOTSON & CO.,**

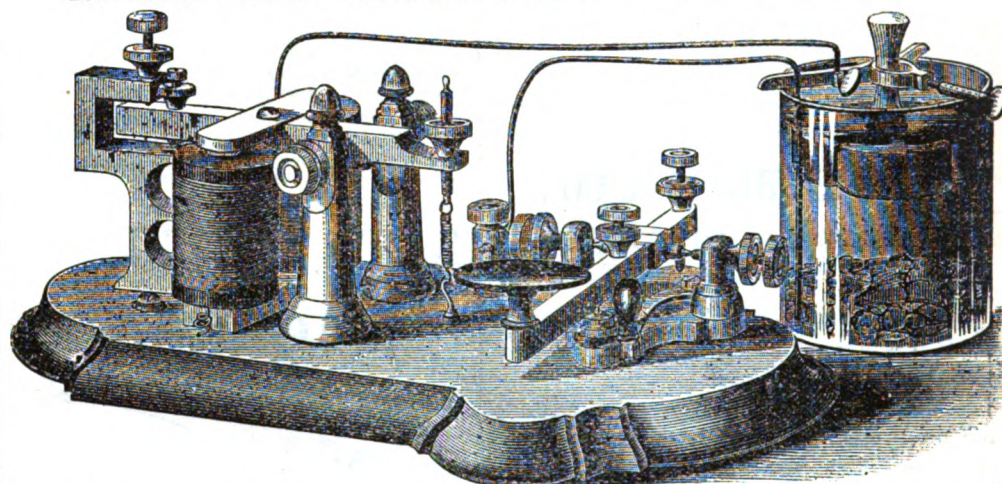
Cincinnati Agency, H. D. ROGERS & CO.,

22 West 4th Street, Cincinnati, O.

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

**BUNNELL'S  
LEARNERS' INSTRUMENT PERFECTED!**

Complete and Perfect, full-sized Sounder and Key complete, with Book of Instruction, Battery, Wire and all necessary Materials.

[These instruments have been greatly improved in their working qualities and in the style in which they are finished. Those having the latest improvement in their construction are those manufactured only by Messrs. L. G. TILLOTSON & Co. JESSE H. BUNNELL.]

These Sets are made in the best manner, and are just exactly the thing wanted

FOR LEARNERS' USES,

FOR TELEGRAPH SCHOOLS,

Or FOR SHORT LINES, from a few feet to 12 miles long.

Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials to put in operation, singly or on a short line - - - - - \$8 50

Learners' Instrument, without Battery &c., - - - - - 6 50

Ornamental Learners' Instrument, Rubber Covered Coils, &c., - - - - - 7 50

Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines up to twelve miles in length, \$1.00 in addition to above prices.

A copy of Smith's Manual, new and enlarged edition (See advertisement in another column) sent with each complete outfit of BUNNELL'S PERFECTED LEARNERS' INSTRUMENT.

These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order or Draft.

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL



## A SUPERIOR PRINTING TELEGRAPH INSTRUMENT,

For Private and Short Lines.

Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. H. SELLEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is **SIMPLE, RELIABLE**, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

### PRIVATE LINES

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employes, &c., for the introduction of the Printer. For further particulars, terms, &c., apply to

**Merchants' Manufacturing and Construction Co.,**

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## JOSEPH MOORE & SONS,

ESTABLISHED 1820,

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## Insulated Wire Manufacturers.

INSTRUMENT AND OFFICE WIRES,

FLEXIBLE CORDS, CABLES,

HEAVY INSULATED LINE WIRE,

RESISTANCE WIRE.

WIRES OF EVERY VARIETY OF INSULATION.

## GEO. H. BLISS & CO.,

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TELEGRAPH INSTRUMENTS AND SUPPLIES in great variety, of the latest patterns and highest finish.

Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on Instruments of our manufacture, when remittance accompanies order.

GEO. H. BLISS & CO.

### The "Snapper" Sounder.



PATENTED MARCH 2, 1875.

Unpolished, 25c. each; \$2.00 per dozen; \$1.25 per half dozen.

Polished 30c. each; \$2.50 per dozen; \$1.50 per half dozen.

Nickel-plated base, screw fastenings, 50c. each.

PRICE  75 CENTS.

Nickel-plated base with knobs and screw fastenings, 75c. each.  
All orders of one dozen or less sent post-paid with instructions.

R. W. POPE, Box 5645, N. Y.

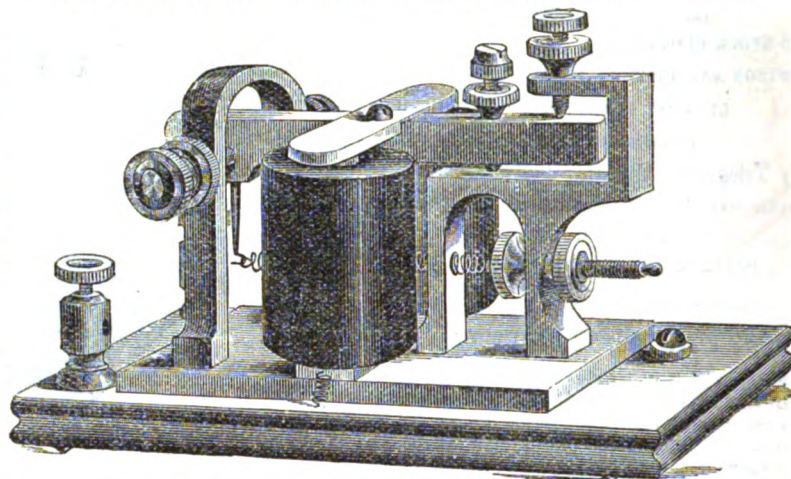
## PARTRICK & CARTER,

THE ONLY MANUFACTURERS OF THE ORIGINAL

## GIANT SOUNDER, PERFECTED,

Patented February 16, 1875.

BEWARE OF WORTHLESS IMITATIONS.



OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND, SINGLE AND DOUBLE,  
with COTTON, LINEN, SILK;  
Paraffined or Varnished, Compressed and Polished.

MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every instrument warranted perfect.

PRICE, sent C.O.D., \$7.50,

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

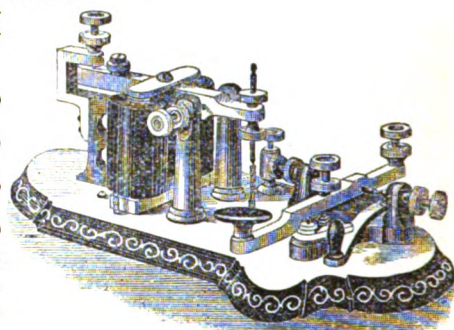
Price of single instrument, good for one mile or less, without Battery, &c. \$6.50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. 7.50

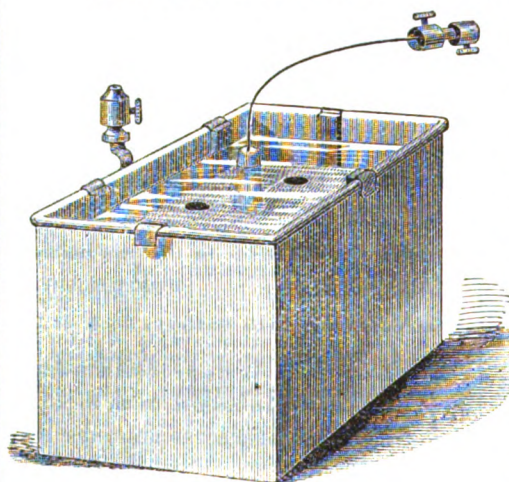
Price of single instrument, good for one to twelve miles, without Battery, &c. 7.50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. 8.50

This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.



## EAGLE'S METALLIC BATTERY.



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

For OPEN CIRCUITS, where all other gravity batteries are acknowledged failures, the Eagle's Battery is found to be in every respect a PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - - - \$2.25  
No. 2, Round " " - - - 2.00

PARTRICK & CARTER, Sole Agents,

38 South 4th Street, PHILADELPHIA, Pa.

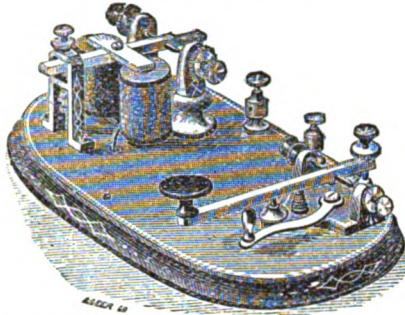


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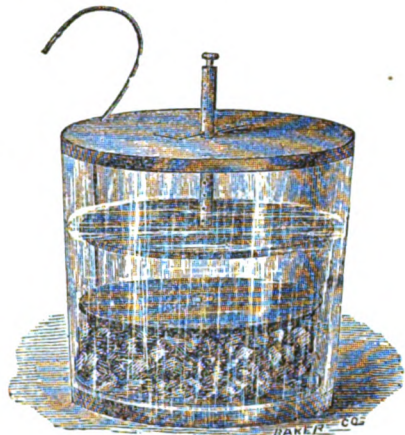
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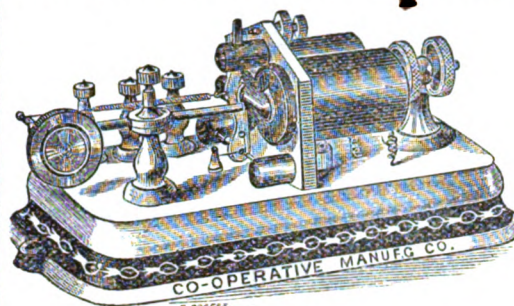
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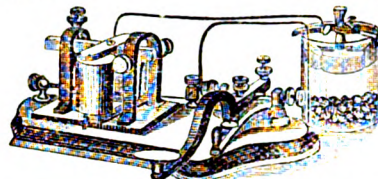
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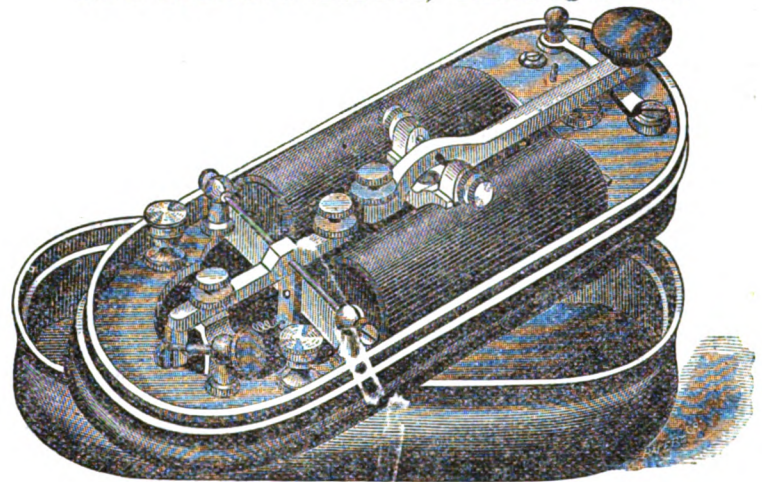
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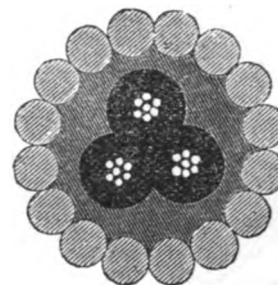
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## UNDERGROUND TELEGRAPH LINES.

The first underground telegraph line was built in England, on the Great Western Railway, between Paddington and Drayton, 13 miles, during the summer of 1839. The line consisted of six copper wires covered with hemp and placed in an iron tube 1½ inches in diameter. The water got into the tube and destroyed the insulation, however, and the tube was subsequently suspended on short posts six inches above the ground and two or three feet from the track. The first telegraph line ever built in this country, between Washington and Baltimore, was intended to have been laid underground. Four No. 16 copper wires, covered with cotton and shellac, were drawn into lead pipes, and ten miles of such cable were laid down from Baltimore to the Relay House, in December, 1843. The experiment proved a total failure, however, from lack of insulation, and the wires were then taken out of the tubes and placed on poles.

Ten miles of underground line were built on Nantucket and Martha's Vineyard, in 1856, but the insulation, which was of gutta-percha, soon failed, and the line was abandoned. Since then no underground lines have been built in this country.

The first extensive system of underground lines was laid down in Prussia. A royal commission was appointed in 1846 to consider the subject of a telegraphic system, of which Dr. Werner Siemens of Berlin was the most active member. In 1846, gutta-percha first began to attract attention in England, and Mr. C. W. Siemens of London sent a sample to his brother at Berlin, to see whether he could use it for the purpose he had in view. Dr. Siemens soon discovered its remarkable insulating properties, and recommended an experiment on a large scale, which having been sanctioned by the Government, he completed an underground line of four miles in length between Berlin and Gross-Bereen, in the autumn of 1847. This having been found to be successful, in the same and the following year more than a thousand miles of gutta-percha coated line wire was laid down underground. These wires were insulated with gutta percha, and encased in lead pipe fitting close thereto, and buried in the ground about two feet. After they had been laid down a few years, much difficulty was experienced in working them, arising from defective insulation, and repairs became necessary continually. The interruptions in the working of the telegraphs occasioned by the constant examination of the buried wires became very annoying and expensive, and the government ordered the underground system to be abandoned and the wires placed upon poles. In 1850 there were 2,648 miles of underground wires in operation in Prussia, and 1,210 additional under construction, all of which was replaced by lines on poles within the succeeding three years. An examination of the buried lines showed that the lead covering had been eaten away by the acids of the earth, thus exposing the gutta percha to the action of the atmosphere, which quickly decomposes it and thus

leaves the wire without insulation. Gutta percha kept in water is so far as is now known, indestructible, but when exposed to the air decomposes in a short time and crumbles like old putty.

In 1852, Russia established an underground line consisting of two wires from St. Petersburg to Moscow, which like the Prussian lines failed, and the government was compelled to abandon them and erect others on poles.

In Denmark the first lines were laid underground in precisely the same manner as in Russia and Prussia, and like results were experienced there also. In 1854, the underground lines were abandoned and the wires placed on poles.

The first extensive underground system of lines in England was commenced in 1852, and consisted in the placing of iron and earthenware pipes underground along the lines of the various railways, and subsequently of drawing loose cables in, which were composed of copper wire insulated with gutta percha, taped, tarred and sanded. The cables were in quarter mile lengths, and test boxes were placed at every mile. The failure of the work came about very soon, and may be said briefly to be due to the same causes which had occasioned the failures of the lines in Prussia, Russia and Denmark.

In 1853, the Magnetic Telegraph Company built an underground line between London and Manchester, consisting of a cable containing ten wires laid in grooved boarding, along the highway. The wires were of No. 16 copper, insulated with gutta percha to No. 3 gauge. The ten wires were placed parallel to each other, in two rows, and served over with two servings of jute soaked in Stockholm tar. The boarding used was of Baltic timber, 3½ inches square, creosoted, and grooved by a special machine; a piece sawed off the bottom was used as a cover. The boarding was placed at the bottom of a trench two feet deep, and the cable was laid in and then covered with the top, which was nailed on. The cable, however, was not run in direct; it was coiled in lengths of about a mile and a half on a drum placed on wheels; the end of the cable was made fast to a gate or other convenient place, and the carriage drawn forward by a horse. When a convenient length, half a mile, had been paid out along the road, it was lifted up and placed in the boarding. Where iron piping was required split pipes were used. At the end of every one and a half miles, and also where it was required to make a set of joints, test boxes were inserted, two feet long by three inches deep, at the same level as the boards. Where boarding was used these boxes were wooden, and iron boxes where the pipes were iron.

The wires were all tested both for insulation and conductivity. All the wires were numbered and marked at their ends with lead numbers. Before the work was finished a great number of faults were found out and removed. They were generally due to fixing the top of the boarding with nails, these being driven in carelessly frequently penetrated the gutta percha and thereby destroyed the in-

sulation. A long length of the line had all its nails removed and the boarding bound with wire.

Notwithstanding the great expense and care with which this work was done, a few years after its completion the wires continually failed. When a fault was located in any one cable the cable was opened and a good wire substituted for the faulty one, the whole cable being restored to the boarding. Subsequently the line was tested in five-mile sections, any section being condemned was replaced by an overhead line and the underground cable removed. This plan was carried on throughout the whole extent of the line. Finally it was endeavored to make six wires good throughout, but in doing this a gradual replacement of the line by an overhead one went on, until at length none of the original work was left. In addition to the replacement, the line was actually renewed in many places. The work itself may be said to have been well carried out. The faults which caused the abandonment of the cables were:

1. Cables lying in dry, sandy places, Gutta percha dried up and contracted, leaving cracks for moisture to percolate through.
2. In dirty, stagnant water, gutta percha became porous and rotten.
3. Fungi, especially near oak trees, formed on the gutta percha and destroyed it.
4. Near gas pipes the gas water penetrated and attacked the gutta percha, causing it to split and open clear through to the wire, the splits being both longitudinal and transverse.
5. Rotting of the gutta percha under the lead numbers.

The underground work in the Isle of Wight consisted of bare India rubber covered wire, put down without any protection whatever. The wires were abandoned in a few years afterwards.

The wires of the British Company, six in number, laid underground between London and Liverpool, were abandoned in a very few years after being laid, one of them never having worked at all.

Mr. Walker, for twenty-eight years the telegraphic engineer of the South Eastern Railway Company, states that he placed twenty-nine gutta-percha covered wires of the best quality underground in the most perfect manner, but in the course of three years they began to show very great signs of leakage. On repairing them he found that decomposition of a new kind had taken place, commencing on the copper wire itself. A gummy substance formed on the copper, and oozed out in small spots continually along nearly the whole length. It was apparently a change in the character of the gutta percha in contact with the wire, and not connected with the action of electricity, because a wire not working behaved in the same manner. The wires encased in iron troughs with tight shifting lids, the earth was damp around them and the troughs were often full of water, though sometimes the troughs in dry weather got dryish. The outer surface of this gutta percha presented all the appearance of a perfectly good article. This change injured the insulation

and convinced Mr. Walker that gutta percha insulated underground lines were undesirable. He said that if the decay had confined itself to the surface means might be found for protecting it, but when the decay commenced internally, the surface remaining perfect, there seemed to be no remedy for it but by abandoning the underground system and putting the wires on poles.

Mr. Edward Highton, a distinguished electrician, was employed by the British Electric Telegraph Company, in 1856, to examine and report upon the cause of the failure of the underground lines, and in the course of this examination he discovered many interesting facts. He first selected for examination a length where the wires passed near the roots of oak trees, and then near the roots of ash and Italian poplar with only one oak tree among them. He found the wires and the wooden boxing had failed, and had been renewed for several yards in passing every single oak tree, including the isolated one above mentioned, and nowhere else.

He had the earth removed from the wires at various places, and selected in particular those spots where the newly replaced wires and boxes joined the old wire and boxes. He found the boxing laid down six months previous in a state of decomposition, whilst old boxing, put down three years before, and within seven yards of the same, was in a good state of preservation. He found gutta percha covered wires perfectly good and completely rotten within seven yards of each other. This proved the action to be local. On opening the first part where the wires were decayed for the purpose of ascertaining the probable cause of the decay, he observed a remarkable peculiarity in the soil, and detected a whitish looking plant resembling the spawn of the mushroom or some other fungus pervading the soil and filling every crevice. This fungus had utterly destroyed all the dead roots of the oak and plants in the hedge. Its branches spread all over and around the wooden trough, covering it with a whiteness resembling a whitewash. Wherever the plant touched the gutta percha wires the gutta percha was rotten.

With regard to the decay of gutta percha in iron pipes Mr. Highton only examined two cases both of which presented remarkable peculiarities. At one place only 46 yards of iron piping existed, the wires passing through the rest of the town being in wooden troughs. He found the wires in a state of decay through the entire length of the iron pipings, with the exception of one inch at either end. The wires in the wooden boxing, in the immediate neighborhood, and up to the commencement of the iron piping, were as perfect as when first laid down. In one of the wires of the iron piping the gutta percha was so decayed and cracked that the internal copper wire was visible. The decay of the gutta percha in iron pipes appeared to be produced by a cause entirely different from that under the oak trees.

Mr. W. T. Henley, a distinguished telegraph engineer, states that he came across several instances where a white fungus had formed round underground wires, and in every instance the gutta percha cracked on bonding. Mr. Henley had found many different kinds of decay in gutta percha wire. On the underground line between London and Dover he found several wires in which the gutta percha had become very similar to leather, and would absorb moisture. This was the worst kind of decay, because when it occurred it would run for miles, whereas in the other kind of decay there would be found alternately good and bad places. Slight warmth is very detrimental to the wires. On first laying down wires in the streets of London they were not diverted away from the bakers' ovens, but experience has proved that a continuance of 80 de-

grees of heat will in three or four years dry up the gutta percha, and render it quite useless. In passing ovens now the wires are always carried through or under the carriage-way. Mr. Henley had taken up wire on other lines which appeared quite sound on the outside, with the exception of a slight black speck here and there, but upon opening these specks he found that each conducted to a large cavity in the gutta percha, the same having decayed next the copper first, and working outwards.

Mr. Cromwell F. Varley, the eminent telegraph engineer, says in relation to the underground wires laid down by him in the streets of London that there was one peculiarity about them which throws a good deal of light upon the causes of defects in cables. One of the wires in this underground system, from Lothbury station to the Eastern office, and in connection with Manchester, was used for a Bains chemical circuit, in which the currents were all sent in one direction, positive current being used; the other wires were all used with the needle instrument in which the currents were both positive and negative alternately. This one wire always improved in its insulation as it was worked on, while the other gradually grew worse, the wires which were not used very frequently remaining for months stationary. Experiments were tried to ascertain the cause of this by shifting the Bain circuit on to different wires, and invariably the same results occurred—the wire improved. This improvement of insulation was traced to the following cause: Positive currents, when the leakage or defect is caused by moisture, have a powerful tendency to expel the moisture; negative currents attract it, and this independently of the oxidation of wire by being made plus to the earth, the positive currents remove the moisture which causes the loss of electricity. This effect only takes place where the moisture is in very small quantity, a very short flow of negative electricity would bring the wire back to its original state of defective insulation.

One of the first things to be noticed in gutta percha is that it is very liable to crack when it is exposed either to light or to heat. At the mouth of tunnels it is almost impossible to preserve the wires, even by covering them with Stockholm tar and tape, which is one of the best preservatives as yet found for gutta-percha. Even in spite of this preparation it is found very difficult to preserve the wires at the ends of tunnels, where they are exposed to wet and dry alternately, and to light. In such places where the gutta percha wire is bare it cracks all over, and if the wire be uncovered from the gutta percha, opposite each crack will be found a little indentation etched in by the electric current. Some pieces have been found with from 200 to 300 such etched marks in a foot, where the gutta percha has been much cracked. A piece of gutta percha covered wire was taken from an underground line connected with one of the Continental cables, which had been injured by the earthen tubes in which it was contained being crushed on it.

The water which occasionally got to this fault, formed a connection between the wire and the earth, but not of such magnitude as to stop the working. In fact, the line continued to work even after the conductor was eaten entirely off. It had been working badly for a few days, when Mr. Varley directed Amsterdam to send a positive current of 120 volts. The current came very irregularly at first, and ultimately almost entirely ceased; he then put on powerful negative currents at London, when the positive current from Amsterdam almost immediately reappeared for a short time, about three or four seconds, and then disappeared again. The positive current

repelled the moisture from the fault, and the negative current attracted it.

Mr. Varley has seen many instances in which gutta-percha covered wire has been eaten through. He first noticed it in 1848 in the London underground lines, but did not then know the cause. Its true nature was made apparent in 1851 in the Kilsby tunnel, where a very similar fault was found in a defective joint. The electric current rendering the exposed wire positive to the earth, electrolytic decomposition of the water, the salts it contains, and the wire takes place, carbonate and oxide of copper being produced until the wire is entirely eaten away. In the majority of cases these faults are at the joints.

An examination of all the facts show that the experience with underground lines in England has been enormously expensive, and has thus far been attended with exceedingly unsatisfactory results. Eight thousand miles of underground wire have been laid down in England since 1852, but a very small portion of which is now in working order, and that portion has been laid down almost entirely within the last three years. The experience in all other countries appears to have been in every respect similar.

Referring to underground lines in Paris, Mr. Shaffner states that the lines insulated with gutta-percha and lead were at an early day abandoned. In 1854 he was informed that the subterranean lines in France had been unsuccessful. In 1857 he witnessed the laying of the same underground wires along the Champs Elysees. Trenches were dug about four feet deep and three feet wide. At the bottom a small trench about twelve inches wide and ten inches deep was dug for the wires to be placed. There were about thirty wires drawn taut, some two inches apart, along and in this trench, sustained by boards temporarily, and until the trench was filled with asphalt and dry gravel. This gave a solid mass of composition around the wires. The wires were covered with cotton and shellac, which was said to give good insulation.

In 1859, M. Emile Saigey, Inspector of Telegraph Lines, says, in respect to the above mentioned line, that the result obtained was only partially satisfactory. Leakage occurred on certain of the exterior wires of the group. On others, serious crosses between one wire and another occurred. When the line had been for some time exposed to gas escapes, the bitumen was softened, and turned from its natural color of glossy black to a sort of chocolate color. The results obtained from the bitumen lines having been unsatisfactory, it was resolved, in 1860, to return again to cables covered with lead; accordingly five copper wires, each covered with two coverings of gutta-percha, and wrapped with tarred cotton tape, were spirally twisted into a cable, and then surrounded by a double tarred cotton tape, and the whole enveloped in a lead tube. This five wire cable was used for the construction of a line starting from the Ministry of the Interior, leaving six wires at the depot Mont Parnasse, five at the Observatory and in the Senate, twenty at the Orleans railway, and fifteen at the Lyons railway. The latter wires were about six miles in length. The lead covered cable was coiled on drums in lengths of about half a mile. The trench was carried below all the gas and water pipes, and necessarily had to be made large enough for the passage of the drum while laying the cable.

Regarding this line, M. Saigey states in the year following its completion, that several wires had failed through defective insulation.

M. Blavier, one of the most eminent French electricians, whose writings are considered a standard

authority on all matters relating to practical telegraphy, in a work written some time after the date of the construction of the subterranean lines referred to above, states that the lines insulated with bitumen, as well as those with gutta-percha coated wires imbedded in cement, have required extensive and costly repairs. Lines consisting of gutta-percha wires or cables in wire tubes, had not been subject to so great inconvenience, and had proved preferable. When there are sewers large enough to be easily traversed, as is the case in Paris and in other large cities, they are useful for subterranean telegraphs. The cost of trenching is avoided, the lines are perfectly under cover and easily accessible, and the addition or removal of wires does not involve any expense beyond the cost of wires themselves.

For underground lines situated outside of cities, along roads, or across the country, the same system of cables enclosed in hermetically sealed cast iron tubes, might be adopted, but as it would be difficult, without excessive expenditure, to secure complete impermeability for long distances, and as the arrangement of the wires in cables increases their proximity to each other, thus affording opportunity for current induction, which is detrimental to transmission, this plan is not favorably regarded. No use is made of underground lines in any country, except where the use of air lines is impossible. Their cost is a great deal. A line of five wires, which costs in France about \$200 a mile, when consisting of iron wire supported by poles, costs \$2,000 if the wires are laid underground. The underground wires are also liable to accidents of all sorts, such as damages from pickaxes, sinking of the ground, escape from gas pipes, deterioration of gutta-percha, etc., and as they are not visible, the repairing of the faults requires lengthy and minute researches. But the greatest and most serious objection to underground lines is in the fact that they make transmission a good deal slower, on account of the electro-static induction, which takes place on the surface of the wires, and the absorption of the electric fluid by the gutta-percha. The retardation due to above causes is not appreciable with the ordinary Morse apparatus upon lines of a few miles in length, but on lines of 200 miles or more, it becomes very damaging. Owing to these reasons, underground lines cannot be generally erected, and their use is confined to cities where it would be inconvenient to attach a great many wires to the buildings, and where special circumstances are opposed to the erection of air lines.

The most experienced telegraphic engineers and electricians of all countries, in which underground wires have been used, are united in the opinion, that thus far at least, their use has been attended with very unsatisfactory results, and that no method of construction yet devised, has maintained underground wires in working order for any length of time.

The underground system is now almost entirely confined to the large towns or cities, and in these the amount used is as small as possible. The wires are brought into the cities on poles as far as the railway stations, and from thence they are carried underground to the principle telegraph stations. Thus the extent of underground wire, compared with the overhead lines, is very small, even in such cities as London and Paris. In London, for example, the South Eastern, London, Chatham and Dover, and London, Brighton and South Coast railways, all terminate at the Cannon Street Station, within a third of a mile of the General Telegraph Office in St. Martin's le Grand, and the wires are all carried on poles as far as the Cannon street station. The short distance from thence to the Central telegraph station, is traversed by underground lines. The same is

true of the wires on the Great Western road, which are brought on poles to the Paddington station, and of the London and North-western, and the Midland, which terminate at Euston Square.

The system of underground lines in England at the present time, embraces about 3,000 miles of wire, out of a total mileage of telegraph line of about 150,000. The conductors usually employed for underground lines consist of No. 18 copper wire, covered with gutta-percha to the gauge of No. 7. In order to keep the gutta-percha from the atmosphere, the exposure to which would cause it to crack and decay and thus destroy the insulation, it is tarred and then covered with linen tape and tarred again. The preparation of tar through which the gutta-percha and taped wire is drawn, is composed of one quart of raw linseed oil to two gallons of Stockholm tar, and is applied warm.

The wires, when thus prepared, are cut into lengths of four hundred yards, and as many as are required to be laid in one tube are made into a loose cable, and tied together with tape at distances of six feet apart. When the wires are drawn into the tubes the tapes are removed and the wires permitted to lay loosely in the pipes.

The tubes into which the wires are drawn, are cast iron socket pipes of two, three, and four inches diameter, the size employed depending upon the number of wires to be laid down. The two inch pipe holding 25 wires; the three inch, 70 wires; and the four inch, 120 wires. The pipes are laid down under the flag stones of the sidewalks near the gutters, at an average depth of twenty inches, and the joints are filled with lead.

Oblong drawing, or flush boxes, made of cast iron, thirty inches long, by eleven inches wide and twelve deep, with lids formed of an iron frame into which a piece of flag stone is fixed, are placed under the sidewalk near the curbing, at distances of fifty yards, in the city of London, and one hundred yards in other parts of London. The pipes enter these boxes through a curved aperture near the bottom, which is open.

As the pipes are laid down, an iron wire of No. 8 gauge is strung through them to draw the cable in with. When the wires are to be laid down they are tied into loose cables, as above described, in lengths of four hundred yards each, and brought to the middle of a section of four hundred yards of tubing. One end of the cable is then attached at the flush box to the iron wire extending through the pipe in one direction, and the other end of the cable to a similar wire extending through the pipe in the opposite direction. The cable is then drawn through both sections at the same time—a distance of four hundred yards—the greatest distance that any part of the cable has to be drawn in the tube being two hundred yards.

The wires are numbered at each four hundred yards, and the boxes are arranged so that the joints and numbers are always in the box. The wires may be replaced in the pipes for repairs or other purposes at any time without interrupting communication, or disturbing the pipes. When a section is found to be defective and to require removal, a cable of wires of the required length is brought to a box near the defective wire and inserted in a loop between it and the next section, and as the defective piece is drawn out of the pipe the new piece is drawn in. Extra wires are always provided when new wires are drawn in, so that renewal is not required until several wires have failed. It is impossible to draw out a portion of the wires without injuring the coating and thereby destroying the insulation. Hence when renewal becomes necessary, all the wires in the section are replaced. The pipes are well cleaned and tarred in-

side while hot in order to prevent rust, which causes the wires to adhere so strongly to the iron as to become difficult to detach them.

The cost of laying down three inch cast iron socket pipe for underground wires in London is about \$1 per yard, or \$1,700 per mile. This includes the cost of the pipe and jointing with lead, the taking up of the pavement, putting the pipe in place and repaving.

The cost per wire for drawing in the pipes depends somewhat upon the number of wires contained in the pipes. The average cost of putting sixty wires in a pipe, including jointing and all other incidental work, is \$280 per mile.

The cost of conducting wire for underground lines, consisting of copper wire of No. 18 gauge, covered with gutta-percha to No. 7 gauge, taped and tarred, is \$85 per mile.

The total cost per mile for sixty underground wires is about \$7,000, or about \$117 per mile of wire.

Since the English telegraphs have gone into the hands of the government a new underground line has been laid down between Liverpool and Manchester, consisting of fourteen conductors, laid in iron and stoneware pipes. The length of the line is about thirty-six miles, and about two-thirds is laid down in stoneware pipes and one-third in iron pipes. The iron pipes are three inch cast iron in nine feet lengths, with sockets for joints. The stoneware pipes are three inches in diameter and three feet in length. The depths at which the pipes are laid are one foot for the iron and two feet for the stoneware. The iron pipes, previous to laying down, were cleaned out with a heavy iron chain, for the removal of any sharp points and burrs. The stoneware pipes were cleaned with a rod with two pieces of iron like half pipes, kept apart by a spring.

The pipes when laid down were carefully adjusted so as to fit closely, and the joints were then made. As each pipe was laid in its place a No. 16 galvanized iron wire was threaded through. The joints in the iron pipes were made by first ramming in some yarn to prevent the molten lead from running into the pipe. A clay mould was then formed around the pipe, and the lead run in—the quantity of lead used for this purpose was about one pound per joint.

In the stoneware pipes the joints were made with Sturbridge clay, which, whilst making a good joint for the prevention of dirt entering the pipe, is sufficiently porous to allow water to percolate through it.

At the distance of every two hundred yards, in straight lines, were placed flush boxes, into which the pipes were led so as to just project within, the space around them being protected so as to prevent dirt from falling into the box. The mouth of each pipe was also stopped to prevent the dirt from getting into the pipe.

The cables were divided into 403 and 404 yard lengths, and the whole work was subdivided into 400 yard lengths—the boxes, at these intervals being termed joint boxes, and the intermediate drawing in boxes. The joint boxes were placed at the distance of 400 yards apart. The intermediate or drawing in boxes, in a straight line, were placed at 200 yards from a joint box, or half way between the joint boxes, but where there were curves in the road, or it became necessary to make a cross, these intermediate boxes were increased as the occasion required.

The cable used in this event consisted of a copper wire of No. 18 gauge (39 lbs per mile) covered with gutta percha to No. 7 gauge (46 lbs per mile) and were manufactured in the same way that ocean cables are made as regards the core,—being covered with two coats of Chatterton's compound, alternating with two gutta-percha, and having total weight of 85 lbs per mile.



The several holes where boxes were located having been opened and the boxes cleaned out, two strong drawing-in wires of No. 11 gauge were attached to the No. 16 wire left in the pipes, the No. 16 wire was then drawn out and No. 11 wires were drawn in for the entire length. To the end of this wire, in which a loop had been formed, were attached the several cables, the attachment being made by stripping the gutta-percha off the copper of each wire for some inches. The copper wires were then passed through the loop, bent back, twisted and secured.

The cables when ready for drawing in were placed upon drums revolving in a stout frame, and at a convenient distance from the mouth of the pipe to avoid friction against the various points. Close to the mouth of the pipe was placed a wooden collar so as to prevent any friction against the edges of the pipe. At the opposite end of the box was placed a mat for the cable to touch instead of the ground, in order that no dirt might be carried in. Drawing in cables in a straight length are begun at the center box, and the cable is drawn through to B and then to C (figure 1.)

In cases where there are two intermediate boxes, the drawing in is done once oftener. The cables are first in from A to B, then the remainder from A to c, and again from c to C (figure 2).

In the case of a still larger number of boxes, the drawing in has to be done oftener. One half of the cables are drawn through from A to b, and from b to B, the other half then being drawn through from A to c, and then from c to C (figure 3).

When a break occurred in the drawing in the cable, the wire was drawn out and laid along the trench to measure the distance of the break; the trench was then opened, a pipe broken, and a wire threaded through the hauling in box, or, if the length was too great, a wire was threaded from the break and also from the box by looping the end, and when sufficiently far through the wire was given a circular or twisting motion, when the looped ends were almost sure to catch. The wires were then drawn out and attached to the broken wire of the cable. After the cables have been drawn through one section of the pipes, they have to be drawn in to the opposite end, and to do this it is necessary to turn them over so as to bring the ends uppermost. The cables as they come out of the pipes are protected by a roller from any friction against the edge of the pipe, and then carefully coiled on to a sheet of canvass. They are then, preparatory to drawing in again, turned over by being coiled down on to the opposite side of the box on to canvass.

The electrical test of the underground wires are similar to those of submarine cables. The battery employed consisted of one hundred Leclanché elements. The testing apparatus consisted of resistance coils and a small mirror galvanometer. It being necessary to test all the joints a special joint trough was made for the purpose. For placing inside boxes it was provided with ebonite feet to insure good insulation, and, in cases where it might be necessary to suspend it, eyes at each corner were made, ebonite shackles accompanying it to improve the insulation. Two hooks were attached to the bottom of the trough to keep the joints in place. For making earth connection a copper plate was carried for such places where water was handy, and also a long iron tube, pointed at the bottom, with a bind-

ing screw at the top to fasten the wire to. This rod was driven into the ground in the dampest places and answered admirably. For testing in the streets of the cities the wire was sometimes fastened to the wire test box, but the rod was found generally to answer better.

For testing the joints were prepared by opening out and unlacing the tape back as far as necessary. The wires were then cleaned with naphtha on each side of the joint. The joint trough was then cleaned and its insulation made good, and then partially filled with water and placed in or over the underground box, according as the length of the wire permitted. The joints were then put in the water and secured under the hooks, the cables being kept from touching the trough by fastening back their tapes,

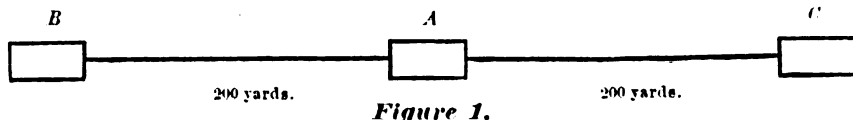


Figure 1.

One lead was then connected to the cable, the second lead being joined to the condenser, whose other end was attached to the accumulating plate in the trough. The third lead was joined to the earth rod. The accompanying diagram (figure 4) will show the connections.

No. 1 lead was connected to the battery key, to which the two poles of the battery and earth were



Figure 2.

connected, the depression of the right hand part sending a zinc (—) current, the left hand sending a copper (+) current. No. 2 lead was connected to the battery key of the resistance coils, which acted as a switch; the left hand, or galvanometer key, being connected to the condenser, (the opposite of which were to earth) the bridge portion of the coils being in connection with the two keys, when depressed, was joined to the galvanometer, whose other pole was to earth.

A depression of the key z, in resistance coils, would at once place the trough in connection with

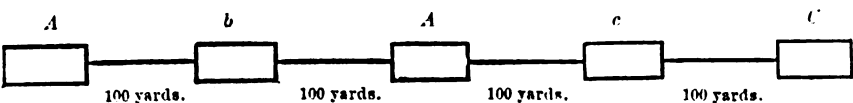


Figure 3.

galvanometer to earth, any deflection (+) would at once show that there was leakage in the trough or over the cable. This had to be remedied before the tests could be taken. If no deflection was observed the tests were proceeded with. The whole cable is then raised to the potential of the testing battery, and the joints as well. If the joints be faulty they must leak, and some of the current must be continually passing into the water.

In testing, the key 2 is depressed so as to put the trough to earth through the galvanometer; the battery key is then depressed and the cable charged; the inductive effect on the trough is at once seen on the galvanometer by its sudden deflection. The cable is still kept charged, and after the induction effect is over the scale is watched to see if the spot remains at zero, or is deflected in the same direction as the inductive charge. If there is a deflection then there is a direct leakage through the joint: if not, then the amount of accumulation is tried. The galvanometer circuit is then broken at k, and both G and z keys of resistance coils depressed for a

definite period—sixty seconds; the leakage from the joints, however small, passes then into the condenser, where it is accumulated. At the end of the 60 seconds the key z is lifted and the condenser charge is passed through the galvanometer to earth. According to the amount of the discharge so is the quality of the joints. If the discharge was too great, or there was a direct loss through the joints, the joints were taken out of the trough, and placed in one at a time in regular order. The discharges from each were observed and noted, the bad joints being marked for renewal. It is a peculiarity in testing a number of joints so placed that the accumulation obtained from the whole of the joints is always less than the sum of the accumulation of the individual joints.

Another method of testing insulated wires for a fault is shown in the accompanying illustration (fig. 5.)

The insulated wire is placed in a coiled form on an insulated drum B, and one end thereof attached to the stem of an electrometer A, in connection, through wire F, with a battery of 500 cells, the end of the battery wire being covered with dry silk, so as to maintain a constant but subdued charge or tension. A small earthenware basin C, filled with water, (having connection with the earth through a galvanometer H,) is placed in an intermediate position between the drum B and the insulated drum D. The wire is then gradually drawn through the water in the basin C and wound upon the drum D. If the insulation is perfect no effect will be produced upon the instrument, but a slight fault will instantly cause the needle to fall to zero.

The underground cables now in use in Paris are composed uniformly of seven conductors, each consisting of a strand of seven copper wires insulated with several thicknesses of gutta percha. They are placed in the sewers, in the catacombs, and in iron tubes under the streets. The cables which are carried through the sewers are enclosed in lead tubes to prevent the gases developed there destroying the gutta percha. In the catacombs, which are free from any development of gas, the seven insulated wires are simply wrapped with a tape serving prepared of sulphate of copper. Eight such cables, supported in a zinc trough 4 inches deep and 2 inches wide, are carried along the sides of the passages. The

temperature of the catacombs seldom varies from 54 Fahrenheit; the atmosphere is damp, the floor being generally only a few feet above the level of the wells, and water is always percolating through the rock. For the lines underneath the streets iron tubes are employed to protect them against mechanical injury, whilst they also prevent the circulation of the air and retard the deterioration of the gutta percha by oxidation and by the escape of the essential oil whose presence seems necessary to preserve its elastic condition. These tubes are like those used for gas: they are of cast iron, in lengths of about 8 feet, their diameter being proportioned to the number of wires which they have to contain. They are planted in a trench a yard deep. The separate lengths are connected with lead joints, and at distances of from 50 to 150 yards a tube is inserted of large diameter, which slides over the ends of two neighboring ones, so that by pushing it back the lines can at any time be got at for repairs. These places are also used for drawing the cables through the tubes. This is done in lengths of 400 yards as

in London, the cable being first well covered with powdered talc to reduce the friction against the sides of the tubes.

Another form of tube for underground lines has been constructed in Belgium. This tube is of iron, with a slit three-fourths of an inch broad along the upper side for laying in the cables, and saving them from the chances of injury by being pulled through. When the cables are placed in the tube, a length of T iron broader on the top flange than the slit, is put into each length and fastened there by means of three iron wedges passing through holes in the upper rib of the T iron. The space above the flange, to the height of the top of the tube, is then filled in with water-tight cement, which seals it up completely, but which can, at any time, be removed with a chisel, in order that the cables may be lifted out and repaired, if necessary. The joint between two lengths of tube is made by a ribbed clip which presses a collar of vulcanized India rubber over two slightly elevated rings on the neighboring ends of the tubes. At regular intervals the tubes enter round testing boxes formed by cylindrical chambers covered with flat lids packed with India rubber rings.

A new method of constructing underground lines has been recently tried in Holland. The tubes are made of creosoted wood, and the wires after being insulated with gutta percha, are placed in the tubes, and the space filled with a residuum of the distillation of coal tar.

Aside from the difficulties incident to the insulation of underground lines there is still another difficulty of equal if not greater magnitude to be encountered, which is due to the effects of static induction. These effects were first observed upon the subterranean lines which were constructed in Prussia in 1848. When the lines were under construction between Berlin and Frankfort-on-the-Main, and Cologne, in 1848, the electricians were astonished to observe that while they were able to speak with the greatest ease on an overland line from Berlin to Magdeburg (76 miles), they found it absolutely impossible to do so on an underground line of the same length. They at first attributed the difficulty to imperfect insulation, but it soon appeared that the better the insulation the greater became the difficulty, and the insulation was actually discharged in order to enable them to communicate. These difficulties were soon justly attributed to the effects of static induction, and on the 18th of Janu-

ary, 1850, in a paper communicated to the Physical Society of Berlin, Dr. Siemens stated that an underground wire, covered with gutta percha, and surrounded by the moisture of the earth, behaved like a colossal Leyden jar. He also found that ordinary telegraph wires charged themselves, though in much smaller degree than the underground wires. These

length of line not exceeding 500 miles. When, however, the line is extended beyond this limit, or if on a shorter length the speed, or in other words, the number of electrical pulsations per minute is greatly augmented, the working of the apparatus will be materially affected. Thus it is practicable, as above stated, to work the ordinary Morse apparatus, at the usual rate of speed, over a line 500 miles in length, but the House printing telegraph, which is a step-by-step instrument, sending pulsations rapidly, can be worked less than one half that distance on a wire of the same size. When this instrument was in use on commercial lines from 1849 to 1861, it was found very difficult to work it direct between New York and Boston, a distance of 240 miles; but it was worked in two sections, from New York to Springfield and from Springfield to Boston, with ease and rapidity. Experience shows that the inductive effect is on the average just about 50 times as great on an underground as on an overground line of the same length, and if we allow 240 miles as the limit of working a step-by-step instrument at a commercial speed on an aerial line, we should undoubtedly find four or five miles to be the utmost limit of distance at which we could accomplish the same result on an underground line. The inductive effect is manifested in all telegraph wires which are surrounded by an insulating substance, outside of which again is a conductor, and the more perfect the insulation and the closer the proximity of the outside conductor, the more marked are the effects. Thus in an ordinary line suspended on poles the air is the insulator surrounding the wire, and the earth, trees, buildings, etc., the con-

ductor outside the insulator. But these being many feet distant from the conductor, the effect is very slight. When the wire is coated with an insulating substance, and buried in pipes, or in moist earth, or submerged in water, the outside conductor is brought close to the wire, and it is evident why the inductive effect is increased fifty fold on a given length of wire, as experience proves that it actually is.

The difficulties incident to working lines having a large static capacity may be partially overcome by the use of instruments especially adapted to the purpose. In 1853, when the underground lines were completed between London and Liverpool, the owners sent to this country for some

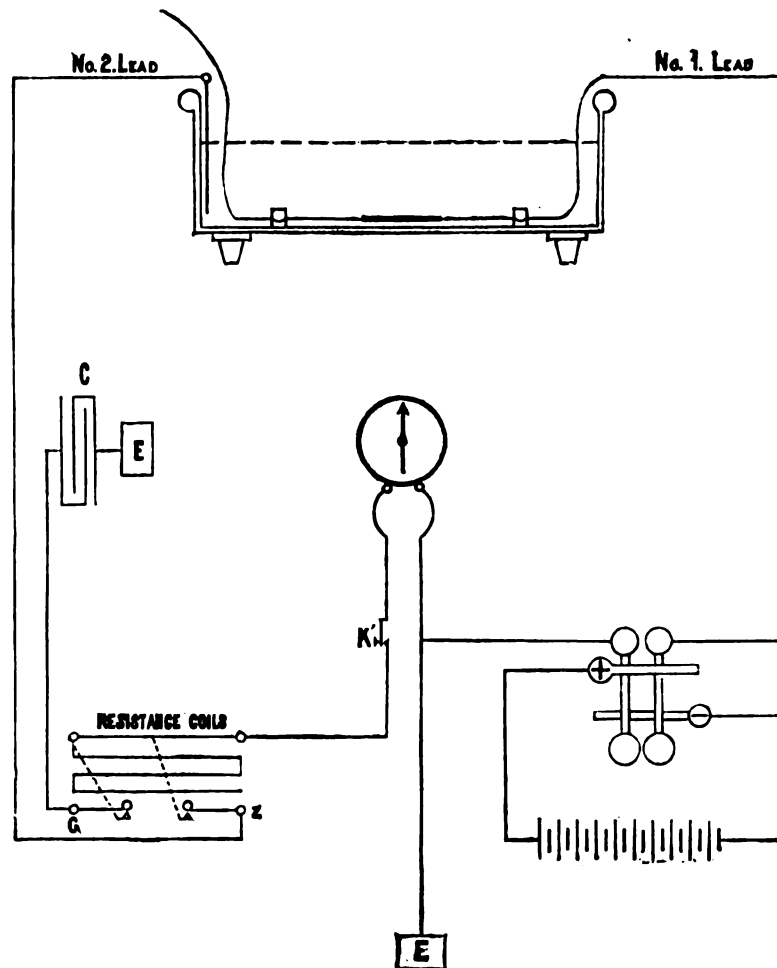


Figure 4.

facts, and the correctness of Dr. Siemens' explanation of them, have been abundantly and repeatedly verified by the experience of telegraphists in all countries from that day to this.

The effect of overground lines is comparatively very small, and with the ordinary Morse instruments, worked at the usual speed, is not seriously felt on a

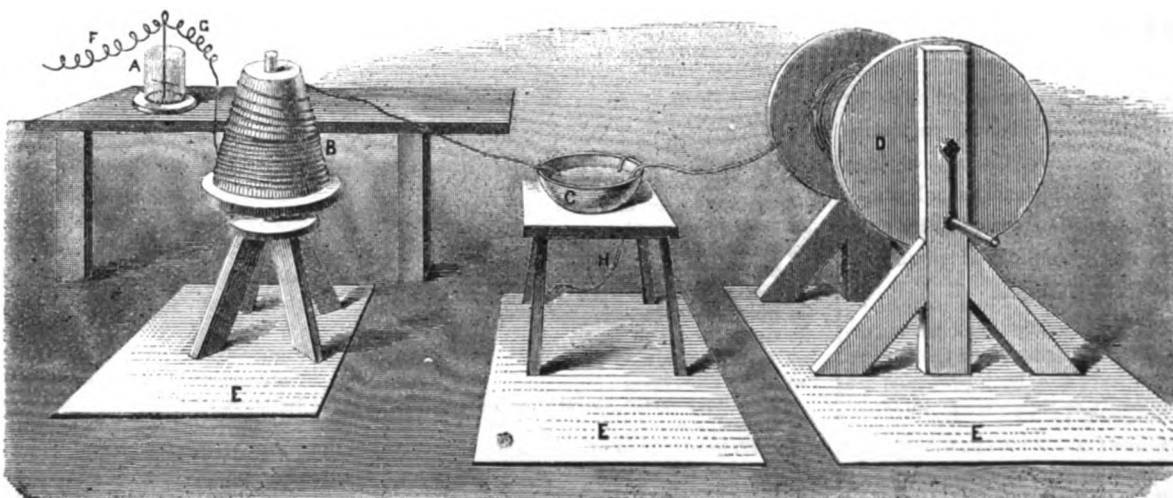


Figure 5.

House printing instruments, (which were successfully worked on the lines between New York and Washington and elsewhere,) and operators to work them. They were, however, unable to get a letter on them through the underground wires, and the Company was compelled to abandon the use of the House instruments, and employ the needle instruments instead. In London the step-by-step instruments for private telegraphing, analogous in construction to the private line instruments so generally used in New York, are all worked on over ground lines. There is not a rod of underground wire used for the purpose in Europe, and underground lines would be totally unsuitable for the purpose. The expensive system of local and metropolitan telegraphs for reporting stock and market quotations, which has been so long in operation in the leading American cities, is entirely unknown on the Continent of Europe, and but little used in London. Much of the traffic which is here performed in all our cities on the wires, is carried in the leading European cities by pneumatic tubes, London alone having thirty of them connecting with the Central telegraph station. In Paris, twelve of the principal stations, in the busiest portion of the city, are connected with the central telegraph station by a pneumatic tube, in which a train of carriers makes the circuit of all the stations once in an hour and carries the messages which have accumulated during that time to the central station, from whence they are transmitted by telegraph. The London system is much better, as each of the principal metropolitan stations has its own tube, and much of the delay of the French system is avoided.

Experience shows the underground system of telegraph lines to be very much inferior to overground lines everywhere, and they are nowhere used (except in the case of the short experimental line between Liverpool and Manchester) where overland lines can be built. They could not be introduced in this country without changing the system of telegraphing now employed for some less rapid and more expensive system, and this change would involve the abandonment of the entire system of stock and market reporting printing instruments, which are now so popular, and apparently so indispensable a part of our commercial life.

#### SORELY AFFLICTED.

The heartfelt sympathy of the fraternity will be extended to Mr. Robert M. Mattocks, of the Western Union office in the Cotton Exchange, in this city, in his sad bereavement by the death of two children within two days, of diphtheritic croup. Mr. Mattocks is one of the oldest and best operators in the country and his friends are numbered wherever his name is known. In such trouble little comfort is to be had from human sympathy, but when the poignancy of their grief shall be mitigated by the lapse of time it will afford this sorely afflicted family much consolation to know of the sympathy extended by their friends and acquaintances in this hour of tribulation.

Men generally take their opinions upon trust, profess them from impulse, and adhere to them from pride. Opinions that have not been professed are often relinquished as easily as they were adopted.

To confute an opponent is not always to convince him, even if he be fair minded; for his opinions may rest on grounds that lie deeper than his arguments, and he himself may not have fully investigated them.

## TARIFF BUREAU.

### SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, December 1, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

#### GENERAL INFORMATION.

Moark, Ark., closed.  
Aptos, Cal., closed.  
Borden's, Cal., closed.  
Turlocks, Cal., closed.  
White Sulphur Springs, Napa Co., Cal., closed.  
Hereafter the "tariff for other lines" from Petaluma to offices named in Cal. on the North Pacific Telegraph line will be as follows:

Arcata, 145	+60	Mendocino City, 85	+30
Bloomfield, 30	+10	Novarro, 85	+30
Duncan's Mills, 60	+35	Petrolia, 115	+60
Eureka, 115	+60	Point Arenas, 85	+30
Ferndale, 115	+60	Rohnerville, 115	+60
Hookton, 115	+60	Trinidad, 145	+60
Hydesville, 115	+60	Table Bluff, 115	+60
Little River, 85	+30	Valley Ford, 30	+10.

Davidson, Col., closed.

Hereafter the "tariff for other lines" from Winnemucca, Nev., to Silver City, Idaho, will be 175 +60.

299 Redmon, Ill., reopened.

456 Stranger, Es., reopened.

Bayou L'Ourse, La., closed.

385 Tigerville, La., reopened.

Hereafter the "tariff for other lines" from Terrebonne to Thibodaux, La., will be 25 and 2.

Winn, Me., closed.

The "tariff for other lines" from Grand Rapids to Tustin, Mich., is 50 and 3.

Ossineke, Mich., closed.

Rifle Lumber Boom, Mich., closed.

45 Melrose, N. Y. (office opened in JOURNAL, May 1, 1875,) is in Rensselaer Co.

Messages addressed Coventry Village or Coventry, N. Y., should be forwarded to Greene, N. Y. for delivery by stage to parties addressed. Charges for delivery 25 cents.

Watkins Glen, N. Y., closed.

Great Belt City, Pa., closed.

Perryville, Pa., changed to Port Royal.

River Trois Pistoles, in last JOURNAL should read Riviere Trois Pistoles, Que., closed.

Acton, S. C., closed.

Chewalla, Tenn., closed.

#### NEW OFFICES.

294 Days Mills, Ala.

360 Corning, Ark.

\* Briceand, Cal., 115 +60 from Petaluma.

\* Cuffey's Cove, Cal., 85 +30 " "

Davenport Landing, Cal.

\* Gualala, Cal., 85 +80 from Petaluma.

\* Henry, Cal., 60 +30 " "

\* Kibessillah, Cal., 85 +30 " "

\* Noyo, Cal., 85 +30 " "

\* St. Joseph's College, Cal., 115 +60 " "

\* Upper Matole, Cal., 115 +60 " "

\* Usal, Cal., 115 +60 " "

\* White Thorn, Cal., 115 +60 " "

553 Cattle Rock, Col.

217 Eatonton, Ga.

\* Boise City, Idaho, 230 +87 from Winnemucca, Nev.

\* Fairview, Idaho, 200 +87 " "

\* South Mountain, Ida. 200 +87 " "

826 Davis Junction, Ill.

848 National Drive Yards, Ill. Check St. Louis, Mo.

326 Stillman Valley, Ill.

290 Bruceville, Ind.

261 Grand Rapids Crossing, Ind., P. O. Laotli.

273 Upton, Ky.

283 Smith's Grove, Ky.

40 Ashley Falls, Mass.

\* Mazatlan, Mex. 625. and 58 from Brownsville, Texas.

118 Leeland, Mich.

147 South Harrisville, Mich., P. O. address Harrisville P. O.

369 Fortstell, Mo.

94 Port Royal, Pa., formerly Perryville.

145 Eastover, S. C.

+ Each additional five or fraction of five words.

#### ATLANTIC CABLE.

On and after December 1, 1875, the word "system" of charging for cable messages will be applied to messages to and from Germany (this includes Baden, Wurtemberg, and German Alsace and Lorraine, which are given separately in tariff book). The rate from London to Germany under this new arrangement will be nine cents for each word.

The cables between W'ladivostock and Nagasaki and between Madras and Penang and the Red Sea cable are broken. Messages for China, Japan, India, and all points beyond Madras will be forwarded by best means until these cables are repaired.

We are notified that messages may now be accepted for transmission by telegraph direct, to places in South America here given with tariff more than the rate to Valparaiso. Iquique, \$12.50 for ten words and \$1.25 for each additional word. Arica, \$18.75 for ten words, \$1.88 each additional word. Islay and Mollindo \$25.00 ten words, \$2.50 each additional word.

#### CUBA CABLE.

Cable communication between Para and Pernambuco in South America, has been interrupted. Messages for places in South America beyond Para (see names of places given after Para in last JOURNAL) if forwarded via the West Indies will be mailed between Para and Pernambuco and from the latter by telegraph to destination.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
New York, November 27, 1875.

To all Transfer Agents:

On December Eighth Money Order Offices will be established at

Yazoo City, Miss., in James Compton's district.

Rushville, Ind., in G. T. Williams's district.

ALONZO B. CORNELL,  
Vice-President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

### RECEIPT OF ASSESSMENTS.

NEW YORK, November 24, 1875.

#### ASSESSMENT No. 79.

5, 19, 39, 59, 84, 100, 103, 114, 122, 136, 139, 206, 228, 232, 316  
328, 366, 371, 441, 456, 482, 516, 556, 557, 617, 652, 690, 701, 710,  
712, 722, 781, 783, 786, 800, 802, 809, 836, 838, 871, 904, 906, 926,  
929, 934, 944, 950, 1000, 1002, 1014, 1016, 1041, 1057, 1085, 1099,  
1105, 1106, 1107, 1108, 1109, 1110, 1112, 1113, 1115, 1117, 1119,  
1120, 1122, 1123, 1125, 1131, 1141, 1152, 1167, 1194, 1224, 1251,  
1255, 1256, 1266, 1277, 1281, 1283, 1284, 1285, 1286, 1339, 1340,  
1342, 1344, 1346, 1348, 1349, 1350, 1351, 1352, 1366, 1405, 1412,  
1421, 1428, 1427, 1430, 1432, 1433, 1437, 1465, 1469, 1471, 1474,  
1476, 1481, 1497, 1513, 1528, 1529, 1530, 1571, 1572, 1573, 1586,  
1597, 1600, 1603, 1616, 1619, 1626, 1632, 1649, 1653, 1657, 1666,  
1672, 1690, 1691, 1700, 1701, 1704, 1733, 1737, 1746, 1747, 1750,  
1751, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1769, 1771,  
1785, 1798, 1799, 1802, 1809, 1813, 1829, 1854, 1895, 1915, 1922,  
1924, 1926, 1982, 2004, 2015, 2023, 2083, 2085, 2112, 2141, 2171,  
2196, 2211, 2226, 2227, 2248, 2253, 2266, 2267, 2275, 2276, 2284,  
2286, 2293, 2300, 2324, 2325, 2326, 2349, 2350, 2395, 2397, 2398,  
2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2425, 2432, 2433,  
2456, 2457, 2458, 2459, 2460, 2461, 2463, 2470, 2471, 2475.

#### ASSESSMENT No. 78.

1490.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

#### DIED.

D'AUVERGNE—At Ravenswood, L. I., November 7, 1875, of diphtheria, Miss Helen D'Auvergne, operator W. U. T. office.

MATTOCKS—At Lafayette, N. J., on Thursday, November 18, of diphtheritic croup, Jennie, aged 5 years and 4 months; and on Friday, November 19, Charlie, aged 2 years and 6 months, children of Mr. R. M. Mattocks, operator W. U. Tel. Co., at the Cotton Exchange. They were both buried at Rosedale Cemetery, Orange, N. J.



## AMERICAN ELECTRICAL SOCIETY.

## ANNUAL MEETING.

The first Annual Meeting of the American Electrical Society was held in Chicago on Wednesday, Nov. 17th, and was very largely attended, many members from various sections of the country being present. The President of the Society, Gen. Anson Stager, presided. The minutes of the organization meeting of 1874 were read by the Secretary and were approved.

The Treasurer's report, which was read and accepted, showed that with the balance in the treasury fund, and when yearly dues were paid and new members qualified, the society would have nearly six hundred dollars available funds.

The Executive Committee made a very full and satisfactory report of what they had done during the year, and although some fault had been found because the papers read before the monthly meetings of the society had not been printed and distributed to the members, the committee were of the opinion that the society would uphold them for not rushing into print every month with but a meagre amount of matter for publication, and give them the credit of acting wisely in husbanding the documents until the end of the year, as they had done, and thus be able, with the large number of interesting papers which have been read before the society during the past year, to form a book of great value and interest to electricians.

Dr. Hill read the following communication from William Sooy Smith, Chairman of the Committee on Physical Phenomena, of the United States Testing Board:

"CHICAGO, Nov. 17.—*Dr. Edward A. Hill:* The Committee on the United States Board to test iron, steel, etc., for physical phenomena, desires to interest those whose tastes or pursuits lead to a study of thermal, electrical, magnetic, and galvanic phenomena, in the work which this committee has in hand.

We hope that careful observations, made with such delicate instruments as you may be able to suggest, employed in ways which you may be able to point out, will lead to most important discoveries.

We believe, for instance, that when a bar is subjected to a tensile or compressive strain, constantly increasing, at the instant that the strain passes the limit of elasticity of the metal and produces a permanent set or change of dimensions of the bar, the molecular disturbance that takes place will be accompanied by a development of heat and electricity in some form which can be observed. The value of such observations in our work, which is of a national character, will be very great, and I venture to ask the assistance of your organization in devising the proper methods and appliances for making them.

Yours very truly, WILLIAM SOOY SMITH."

This paper was discussed by several of the members, and on motion, C. H. Summers, Dr. E. A. Hill, Gen. A. Stager, Chicago; C. H. Haskins, Milwaukee, and Thomas Benning, Buffalo, were appointed a committee to take the subject into consideration.

Resolutions of respect to the memory of Dr. J. N. Lapham, late State geologist of Wisconsin, and a member of the society, who died of heart disease at Manitowoc, Wisconsin, a short time since, were then adopted.

A number of scientific papers, that had been read at the monthly meetings, were read by title, and ordered printed in book form, with cuts and diagrams representing the various subjects treated therein.

The report of the Special Committee on Amendments to the Constitution was then considered and after much discussion the Constitution was amended to the effect of abolishing the holding of monthly

meetings. Hereafter the society will meet annually at such places as the Executive Committee may determine. Auxiliary societies will be formed in the various cities throughout the country. Papers coming before those auxiliary societies will be referred to the annual meetings of the main body.

The following officers for the ensuing year were then elected unanimously: President, Anson Stager, of Chicago; First Vice-President, C. H. Haskins, of Milwaukee; Second Vice-President, George B. Prescott, of New York; Third Vice-President, Harvey P. Dwight, of Toronto; Fourth Vice-President, John Van Horn, of New York; Fifth Vice-President, I. N. Miller, of Chillicothe, Ohio; Sixth Vice-President, E. P. Wright, of Cleveland; Seventh Vice-President, J. J. Diekey, of Omaha. Corresponding Secretary and Librarian, F. W. Jones, of Chicago; Treasurer, E. B. Chandler, of Chicago; Executive Committee, C. H. Summers, J. J. S. Wilson, Wm. Henry Smith, G. H. Bliss, F. H. Tabbs, all of Chicago; Directors, W. W. Smith, of Indianapolis; S. D. Field, San Francisco; George T. Williams, Cincinnati; C. O. Rowe, Pittsburgh; R. C. Clowry, St. Louis; N. Hucker, Buffalo; Hugh Neilson, Toronto; O. H. Booth, Mansfield, O.; J. W. Tillinghast, Buffalo; W. C. Long, Dr. E. A. Hill, Chicago; A. Hayward, Vincennes; E. Sholes, Dubuque; C. W. Ross, Columbus, Ohio; M. C. Bristol, Cincinnati.

The following named gentlemen were also unanimously elected honorary members: Z. G. Simmons, Kenosha, Wis.; Wm. Orton, New York; T. C. Mendenhall, Columbus, Ohio; J. D. Layng, Pittsburgh; Cyrus W. Field, New York; Thos. Swinyard, Toronto; Sir Hugh Allan, Montreal; Dr. N. Green, New York; A. B. Cornell, New York; Moses G. Farmer, Salem, Mass.; J. D. Caton, Marvin Hughitt, Chicago; Joseph Henry, Washington, D. C.; J. H. Wade, Cleveland.

It was then decided to hold the next annual meeting at Chicago on the third Wednesday in October, 1876. After which, and the passing of some complimentary resolutions, the meeting adjourned.

## OREGON INDIANS OPPOSED TO THE TELEGRAPH.

Several times mention has been made of the opposition of the Indians at the Umatilla reservation to the work of opening a road and building a line of telegraph through the grounds included in the limits of the reservation. The line has been completed as far as Baker City, and in constructing it through Walla Walla it is found necessary to cross the lines of the reservation. For some reason the Indians are bitterly opposed to the work going forward, on the ground that they regard it as an encroachment. Justly considering the magnetic telegraph one of the potent levers of civilization, these noble red men of the primeval forest think they have seen quite enough of American civilization to suit them. They, therefore, have arrayed themselves in direct and open hostility, and declared that not a pole shall be planted or a wire stretched across the *illike* donated them by Uncle Sam. When trouble was at first menaced, the department at Washington was notified of the opposition of the Indians. Orders were forwarded at once authorizing the construction of the line, as proposed, through the reservation lands. But it appears from recent events that the "Lo's" are up in arms, and do not propose to regard the instructions given by the Government. The following despatch, received here yesterday from Walla Walla, will serve to indicate the spirit of resistance among the Indians:

"L. McManis, who is just in from Weston, reports that the Indians, to the number of thirty or forty, armed, came to the camp of the men engaged in

building the new road and telegraph line over the Blue Mountains last night, and drove them off, threatening to kill them unless they left at once, which they did, having no arms with which to defend themselves, and leaving all their tools and provisions."

Immediately on receipt of the telegram, Mr. Platt Burr, Superintendent of Construction, who is now in this city, went to the headquarters of the Department of Columbia, and apprised Col. H. Clay Wood, who is acting temporarily as commander of the department during the absence of Gen. Howard, who is now at the Dalles, en route for Portland, the latter was notified by telegraph of the condition of things. He sent a despatch at once to Col. Elmer Otis, who has charge of the troops at Walla Walla, authorizing that officer to protect the men engaged in opening the road and building the line from the threatened attack at all hazards. This may be regarded as the termination of the anticipated difficulty, as the Indians will scarcely have the hardihood to openly resist the military power of the Government. — Albany, Oregon, *Daily Morning Call*.

TABLE, SHOWING THE EXTENT OF GOVERNMENTAL TELEGRAPHS, TOGETHER WITH THE RECEIPTS AND EXPENSES FOR THIS YEAR ENDING DECEMBER 31ST, 1874, COMPILED FROM THE OFFICIAL REPORTS.

Object of Statistics.	German Empire.	Austria.	Hungary.	Belgium.	France.	Norway.	Holland.	Servia.	Sweden.	Switzerland.
Length of lines in miles.....	30,637	19,717	8,518	3,060	31,243	4,387	2,132	908	6,816	3,770
" " wires " ".....	75,046	51,397	28,708	13,360	83,163	6,960	7,666	1,383	16,186	9,276
Government Offices.....	1,686	867	856	574	4,006	106	188	37	140	815
Railroad or Private Offices.....	2,116	1,170	...	...	...	64	170	...	341	94
Total Offices.....	3,802	2,037	856	574	4,006	170	358	37	481	899
Interior Messages sent.....	6,992,171	1,692,089	1,847,147	6,369,357	470,236	1,340,639	292,640	514,383	1,846,898	1,846,898
International ".....	1,468,026	678,521	89,884	329,813	914,404	114,691	292,640	26,376	137,920	286,420
Total Messages sent.....	8,460,196	3,024,688	1,737,473	2,178,900	7,283,861	584,927	1,633,472	130,378	862,103	2,133,317
Receipts of Interior Messages.....	\$1,337,400	1,100,367	467,709	121,920	1,607,700	146,363	169,124	70,367	213,418	183,638
" " International ".....	945,718	...	...	186,760	1,060,985	197,000	101,995	7,704	140,021	133,318
Sundry Receipts.....	19,645	134,048	22,160	994	115,855	6,550	...	...	7,106	25,739
Total Receipts.....	\$2,302,763	\$1,234,375	\$490,868	\$399,680	\$2,784,540	\$349,923	\$271,119	\$28,318	\$160,545	\$342,695
Extraordinary Expenditures.....	\$697,937	\$47,620	\$19,764	\$236,632	\$62,290	\$80,711	\$34,800	\$6,290	\$123,407	\$36,259
Ordinary ".....	3,012,971	1,741,708	713,960	438,763	2,604,086	219,016	426,994	\$3,930	\$721,964	\$36,865
Total Expenditures.....	\$3,710,908	\$2,221,734	\$701,472	\$649,619	\$2,730,718	\$299,727	\$497,913	\$40,223	\$195,361	\$73,124

Gov. Shunk, of Pennsylvania, vetoed the first bill that came before him for the incorporation of a telegraph company, on the ground that "it would interfere with the business of the United States mails."

Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcomed as a friend. No better medium for advertising exists.

**TERMS:**

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**JOURNAL OF THE TELEGRAPH.**

**Western Union Telegraph Company.**  
195 Broadway, New York.

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Quarter Column, 2½ Squares, each insertion.....	4 00
Half " " .....	8 00
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Business Notices, on Editorial page, 50 cents per line, each insertion.

Nothing inserted for less than one dollar.

A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, DECEMBER 1, 1875.

We still receive communications from employees regarding the correct manner in which to count the names of cities or places which are composed of more than one word, when such names are given as titles to *things*. Rule 9 of the Book of Regulations is very explicit on this point and this fact, added to the other fact that the question has been explained and decided a great many times in the JOURNAL would seem to be sufficient to settle the matter for good and all. Let it be distinctly understood that the word San Francisco, St. Louis, New York, Rock Island, or any similar combination, when used to express the name of a place, are to be counted as one word each, but when used as a name for a thing, as "San Francisco Hotel," "St. Louis market," "New York steamer," or "Rock Island Depot," the name is to be counted according to the actual number of words contained. Thus in this last example each of the names are two words and the thing itself one more. This answers the last four inquiries we have received upon the subject, and it is intended to govern not only the names given, but also every analogous case.

The important and responsible position of Cashier of the New York office of the Western Union Telegraph Company, made vacant by the removal of Leonard Cox, has been filled by the appointment of Mr. Henry H. Ward, Treasurer and Secretary of the Gold and Stock Telegraph Company, which latter position he resigned on Nov. 15th, and at once entered upon his new duties.

We have had occasion heretofore to speak of Mr. Ward, in terms appropriate to his many and high qualifications, and it is with much gratification that we again find an opportunity to place on record another evidence of the esteem and confidence in which he is held by the company.

### ANOTHER CRUMB OF COMFORT.

At a special meeting of the stockholders of the Franklin Telegraph Company, at Boston, on Tuesday, Nov. 16th, the report of the Committee of Stockholders, appointed at a previous meeting to investigate the accounts of that Company, in connection with the Atlantic and Pacific Company, revealed a singular condition of affairs, the contemplation of which will probably add but little additional comfort to that already experienced by the unfortunate, but plucky minority, in contemplating the debt saddled upon the company, for what the "memorandum" of the President of the Atlantic and Pacific Company, which was read at a previous meeting in place of a detailed report, vaguely set down as "improvements."

The committee made quite a voluminous report, the gist of which was that they had proceeded to New York and had thoroughly and carefully examined the accounts, from the time the business of the two companies had been practically under one management, and so far as the accounts went, found that they had been correctly kept. The earnings of the line from April 30, 1871, to Sept. 1, 1875, were \$1,135,516, and the expenditures, \$1,026,953. This exhibit shows a clear profit over *all* expenses, of \$108,563, brought down to Sept. 1, and to this must be added the \$51,385, which, according to that pleasant little "memorandum" before referred to, had been borrowed by the Atlantic and Pacific Company as managers, for the "improvements" account of the Franklin Company. The report also criticises some things in connection with the management of the business of the company heretofore, since its connection with the Atlantic and Pacific Company, but what these things are is left to conjecture. It certainly cannot mean to criticise the disposition of that \$160,000 surplus earnings and borrowed money. When the President and Secretary of the Franklin Company, who are likewise President and Secretary of the Atlantic and Pacific, print and circulate the report of the committee, which course was directed by the meeting, this doubt may be cleared up. Meanwhile the minority are still struggling in the courts of Boston for their rights, which, they claim, can be protected only by a dissolution of the Company and sale of the property:

**SOUTHERN AND ATLANTIC TELEGRAPH  
COMPANY.**

The annual meeting of the stockholders of the Southern and Atlantic Telegraph Company, for the election of a Board of Directors for the ensuing year, and such other business as may properly come before them, will be held at the executive office of the Company at 51 New street, in this city, on Thursday, December 2d.

It is understood that the annual report of President Blossom will present a much better exhibit of the condition of affairs than any before made, a result largely due to the wisdom exhibited in the ar-

rangements made in February last, by which the Company secured a reliable connection and outlet for their business.

### TELEGRAPH RATES.

The following table, compiled from the official reports, will show the number of messages transmitted, and the receipts and expenditures for the same by the various government telegraphs of Europe and India for the year ending January 1, 1874, the last year for which complete returns have been received:

Countries	Number Messages	Total Receipts	Receipt per Mes.	Total Exp'dre per Mes.
German Empire.....	8,767,669	\$2,466,045	28	\$3,088,689
Bavaria.....	1,057,639	230,851	22	166,112
Wurtemberg.....	454,747	78,636	17½	17,392
Austria.....	3,765,252	1,501,816	40	1,953,365
Hungary.....	2,131,712	587,138	28	798,168
Belgium.....	2,054,431	354,287	17½	477,105
Denmark.....	349,658	139,091	40	161,352
France.....	6,919,382	2,678,087	41½	2,736,000
Great Britain.....	18,744,650	5,024,665	26½	6,145,414
Indo-European.....	29,527	281,283	95	390,933
British India.....	651,796	769,257	118	1,832,278
Italy.....	4,267,767	1,428,361	33½	1,148,521
Norway.....	508,390	212,576	42	229,502
Holland.....	1,590,779	267,186	16½	438,987
Dutch Indies.....	228,264	149,178	65½	264,232
Russia.....	2,887,297	3,515,311	122	3,238,023
Servia.....	118,509	32,869	27½	66,452
Sweden.....	769,041	328,907	42½	352,245
Switzerland.....	1,919,298	325,203	17	332,672
Portugal.....	247,674	79,013	32	151,000
Roumania.....	620,453	166,643	27	399,977
	\$58,081,835	\$20,810,213		\$24,459,227

The total number of messages sent was 58,081,835. The total receipts were \$20,810,213. Average receipts per message, 35½ cents. Total expenditures, \$24,489,227. Average expenditure per message, 42 1-6 cents. Excess of expenditure over receipts, \$3,699,014.

It will be observed that only four countries out of the twenty-one paid their telegraphic expenses out of their receipts, viz., Russia, whose average charge was \$1 22; Italy, 33½ cents; France, 41½ and Bavaria, 22. Bavaria receives a considerable sum annually for transit messages passing across its territory, which require no service whatever within the kingdom.

The reduction on the rate of tolls since 1867 have been as follows: France, 22 per cent; England, 33 per cent.; Switzerland, 22 per cent.; North Germany 26 per cent.; Holland, 8 per cent.; Russia, 9 per cent. Bavaria, 31 per cent., Norway, 18 per cent.; Italy, 8 per cent. In Wurtemberg, Sweden and Denmark there has been an increase in the rates, and in Belgium there has been no change.

## UNDERGROUND WIRES.

**THE WESTERN UNION COMPANY'S EXPERIMENT.**

Active preparations are making by the Western Union Telegraph Company for laying the pneumatic tubes and subterranean wires between the main office of the company and the Broad Street office, permission for which was granted by the Common Council last week. Already the pipes and valves have been completed and the engine is under way. If the weather proves favorable, it is the intention to have the tubes in working order by January 1, 1876. There will be two tubes, each of which will consist of a lead pipe having 2½ inches inside diameter, encased in iron pipe, having an interior diameter of 3 inches, the latter being designed as a protection to the lead. The cylinders of the air-pumps for

compressing and exhausting the air in the tubes have a diameter of 35 inches. Messages from the main office will be dispatched by means of compressed air through one of the tubes, while those to be returned to the central office will pass through the other tube by exhaust air, the engine, pumps and valves all being placed in the central office. The carriers are made of gutta-percha, covered with felt cloth, the forward end being sufficiently enlarged to fill the tube and thus prevent the passage of air in either direction beyond the carrier. It is estimated that the time occupied in sending a message from the central office to the office in Broad Street will be about 25 seconds, while the arrangement will be such that one carrier, if necessary, can immediately follow another.

George B. Prescott, the electrician of the Company stated recently to a reporter of *The Tribune* that the plan of laying the wires will not differ materially from that at present in use in London, although some few improvements will be introduced. The system in London, said Mr. Prescott, consists of insulating small copper wires with gutta-percha, which are drawn through 3-inch iron tubes, laid under the sidewalks. At the end of every 50 yards in the city there are boxes, called 'flush boxes,' where the wires can be reached in case of trouble, while as often as every 400 yards the wires are joined. Gutta-percha is the only substance which has been found available for insulating underground wires, and this becomes soft at about 115° Fahrenheit, while if exposed to the atmosphere, to street gas, many chemical substances, or stagnant water, it becomes rotten and unfit for use. The difficulties, however, arising from defects in insulating, it is found, are very satisfactorily overcome by the use of wires covered with gutta-percha and then encased in iron tubes; but the difficulties arising from static induction are fundamental in their character, and cannot be obviated by any improvements or modifications of subterranean construction. All telegraph wires, without regard to their position, are thus affected, but wires placed underground or water are affected 50 times as much as those which pass through the air, the amount of the static charge in aerial wires being inversely proportional to the distance of the wires from the earth. The amount of the static charge in all telegraph wires whether stretched through the air or buried under the ground, is proportional, also, to the length of the wire, and consequently an underground wire of half a mile to a mile in length may be worked without any inconvenience from the presence of the static charge, while one of greater length may give rise to the most serious trouble. The situation of Manhattan Island is such that, if we were forced to put all our wires under ground throughout the city each line would have a length of at least 10 miles buried under the earth, thus giving a static capacity equal to 500 miles of wire stretched on poles; or in working a wire extending under ground from this city to Buffalo or Pittsburg, we should be compelled to operate a line having a static capacity of about 1,000 miles. This length of line would be impossible to work at anything like the present rate of speed, the rate of speed on long telegraph lines being inversely proportional to the amount of the static charge thereon.

Mr. Prescott also stated that he was sent to Europe about three years ago for the purpose among others of examining the question as to how far underground telegraphy was practicable, which he did by visiting England, France, and Germany. There are in England, he said, about 150,000 miles of telegraph-wire, of which only 3,000 miles are under ground, while in France and Germany

the proportion is much less than in England. Over 20 years ago under-ground wires were constructed in Prussia extensively, but they were all abandoned, and other wires placed upon poles, for two reasons; first, because it was found impossible to keep them properly insulated, owing to the deterioration of the gutta-percha, and, secondly, because the Morse apparatus could not be successfully worked in connection with the under ground wires, on account of the retardation of the current by static induction, even when the wires are insulated. The same was true in England and France. All the subterranean lines laid in those countries were taken up or abandoned and replaced by wires on poles. In some of the cities, however, and particularly in London, Paris, and Berlin, some of the wires have been and are still carried under ground. In Paris a large amount of money has been expended in under-ground experiments, but no plan proved successful until, by order of late Emperor, Louis Napoleon, the wires were insulated with gutta-percha and then made into cable, somewhat resembling the submarine telegraph cables, only that they contained a larger number of conducting wires to each cable. The cables were then fastened to the apex of the large sewers, or, where these sewers did not exist, they were passed through the catacombs. The wires, however, do not extend all over the city, as they do here, but come in by way of the various railroads, from which they are concentrated at a central station. When the message is ready for delivery it is sent out through a pneumatic tube, of which there is an extensive system in Paris; but so inefficient is the telegraph service there that a private company some time ago got up a velocipede express to deliver messages.

The English underground system is the best in the world, and London is better adapted for underground telegraph lines than any of our American cities, for the reason that there are not so many changes and improvements constantly making. All the railroads have stations centrally situated in London, most of the roads coming into the heart of the city. The Great South-Eastern Railway, for instance, has a station at Cannon st., which is only one-third of a mile from the General Post Office, where the headquarters of the English telegraph lines are situated. Now, these telegraph wires are placed on poles and follow the lines of the railroads into the stations, where they first pass under ground, running as subterranean lines only from the railroad termini to the central telegraph station. Hence, the quantity of underground wire in London is comparatively small. In addition, it may be stated that in all parts of the city there are certain large distributing telegraph offices which are connected by wires with all the sub-stations in the city—of which there are 400 to 500—and every wire from each of these distributing offices to the several hundred sub-stations is carried over the house-tops; where there are several wires running to the same station, they are insulated on poles which are fastened to the tops of the houses. In addition to those that have been mentioned, there are in London 800 private lines, running to all parts of the city. They use what is known as the Wheatstone dial instruments. There is not a single rod of wire working all these instruments that is under ground, the wires all being carried over the house-tops. Frequently 40 to 50 insulated wires are made into a single cable, which is suspended on fixtures attached to the roofs of the houses. It is not probable that these instruments could be worked on underground wires.

In 1854 a telegraph company was organized in England which constructed an underground line between London and Liverpool, the cable contain-

ing 10 wires. This company sent over to the United States for two House printing telegraph instruments, as an experiment, with a view of adopting the system for the whole line if it proved successful, and, although they took the precaution to secure the assistance of two experienced American operators, the instruments refused to record a single signal. After six weeks trial the Company adopted the English needle system, but in less than two years after the line was built its insulation became so much impaired that the company was obliged to take up and replace a considerable portion of the cable. One wire after another still continued to fail, until there were only five of the ten that would work at all. After this, as others failed, sections of the underground line were abandoned and wires placed on poles were substituted, until, finally, so much of the underground system had failed that the Company decided to place the whole line on poles. The copper and gutta percha which constituted the valuable portion of the underground cable were taken up and sold for enough to replace the whole system with a good overland line. All similar lines that were ever constructed in England have been abandoned, except one of thirty miles, constructed by the Government nearly three years ago as an experiment, which is the only line outside of the cities."

In like manner, Mr. Prescott continued, 20,000 miles of underground lines in England, France and Germany have been abandoned. The question has been repeatedly asked, Why cannot the wires operate underground in New York as well as London? The answer is, that the only telegraph lines which are underground in London are those upon which the general telegraph business is conducted between London and the various cities and towns in the United Kingdom, and only a very small portion of these pass under ground; all the local telegraph lines are carried over the house-tops; the great bulk of the telegraph dispatches in the City of London are transmitted through the pneumatic tubes, of which there are 27, extending from the general telegraph office to the principal business points in the city. The telegraph system upon which the underground wires are employed is essentially different from that in use in New York or elsewhere in America. In England the open circuit is used exclusively, while in the United States the closed circuit is generally employed; in England only two stations communicate upon the same wire, but in the United States as many as 50 stations are connected with and communicate upon one wire. The distance over which the average telegram is transmitted in England is very short, the longest circuits being only 300 to 400 miles long, while in the United States dispatches travel as many thousand miles. In the City of New York there are over 5,000 miles of telegraph wire in operation, four-fifths of which are used for local communications, stock reporting instruments, and private lines.

There is no part of the world where lines of this character are worked underground. If a law should be passed compelling the companies to place their wires underground, the whole system of communication would have to be changed. But, even were it practicable to work our system upon the underground lines, it would be impossible to place all the wires in the City of New York alone underground in less than four or five years. In London the lines were placed under ground from the beginning, and the additional wires have been put in as the business has extended. The process of making the joints for underground lines is one requiring great care and much time. In Vienna, one of the handsomest cities in Europe, there is not a rod of telegraph wire underground. The wires are insulated on iron poles, some of the poles carrying as many as eighty-eight wires, and extending through the Ring-strasse, the finest street in the city.



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**Sisson's Improved Tidy Fasteners.**

NO FAMILY SHOULD BE WITHOUT IT.

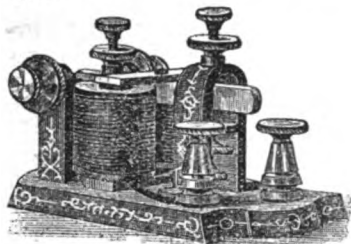
Sells rapidly. Money in it. Send 25 cents for samples.  
Gross, \$7.00. Quarter Gross, \$1.75. Agents wanted.

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**T**HE undersigned is prepared to contract for the prompt delivery of TELEGRAPH POLES of any size and quality.

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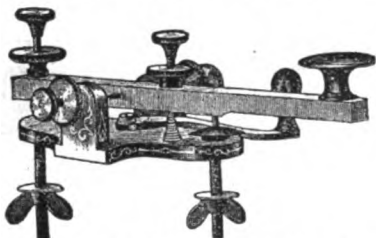
I am now making a specialty of my PHIL. SHERIDAN SOUNDER AND KEY, and am manufacturing them in large quantities, so that I am able to offer them to the public at a very low figure.



PHIL. SHERIDAN, \$4.00.

The above cut represents a beautiful little Sounder. It is made of the best material and highly finished. It has a heavy lever, full sized magnets, and altogether is a first-class instrument. The magnets are wound with green silk insulated wire.

Polished Rubber Covers, 50c. Extra.



PHIL. SHERIDAN KEY, PRICE, \$2.00.

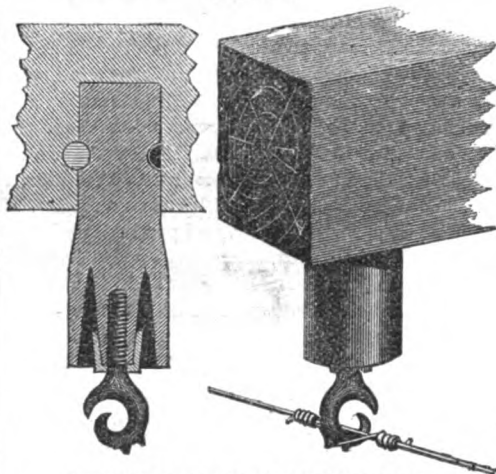
You can see at once that the above cut represents a first-class Key in every respect. It is highly finished, has large platinum points, strong lever, friction circuit-closer, spring adjustments, etc., etc. As a Learner's set they have no equal, as they are regular Telegraph Instruments, same as are used on all railroad and commercial lines.

One Cell Callaud Battery, 1 lb. Blue Vitrol, Connection Wire, Book of Instruction, etc., all for \$1.50. Making a Complete Outfit for office, only \$7.50.

These Instruments will be made to work on from a few feet to 5 miles of line, at the same price. Parties ordering please give length of line that instruments are to be used on. Every set warranted to be just as represented and to give entire satisfaction.

All kinds of Telegraph Instruments and Supplies constantly on hand at the lowest price.

Goods will be sent C. O. D., or on receipt of price. Send stamp for Price List and Catalogue.

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IMPROVED CURVED KEYS, LATEST AND BEST,  
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SPLENDID NEW POCKET RELAYS, AND  
REGULAR RELAYS.Address  
GEO. M. POMEROY, San Jose, California.**THE KENOSHA INSULATOR CO.**Telegraph Companies and Telegraph Constructors  
are invited to examine the merits of our new and improved  
patterns of**KENOSHA CARBON INSULATORS!**

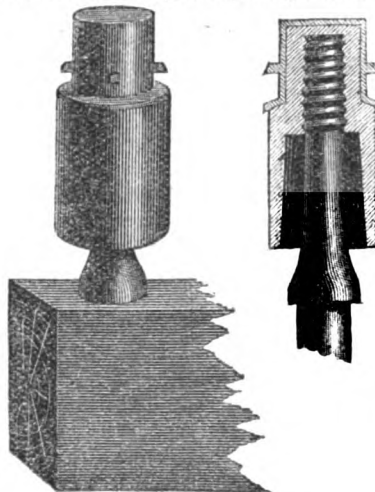
These Insulators are made of wood, thoroughly baked, and covered with an INDESTRUCTIBLE COATING, highly repellant of moisture, which does not change nor deteriorate after years of exposure to the weather.

THE KENOSHA INSULATOR has now stood the test of Six YEARS' actual service, and we feel warranted in stating that, although costing but little, if any, more than the ordinary glass insulator, its insulating qualities are, on an average, MORE THAN TEN TIMES AS GREAT during the prevalence of rain or fog.

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is manufactured with the utmost care by skilled workmen and special machinery. Every individual insulator is TESTED IN WATER with a battery of 500 cells, and not a single imperfect one is allowed to leave the factory.

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These insulators are packed for shipment in boxes containing 100 each, and may be ordered direct from us, or through any of the leading dealers in Telegraph Supplies.

We are now prepared to fill all orders promptly, however large, and we guarantee all Insulators furnished by us to prove entirely satisfactory.

**THE KENOSHA INSULATOR CO.**

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GENERAL EASTERN AGENTS.

THE WESTERN ELECTRIC MFG. CO., of Chicago,

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**\$5 to \$20** per day at home. Samples worth \$1 free. BRINSON & Co., Portland, Maine.

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PATENT PENCIL HOLDER.**

This Holder is intended to save the last half or third of the pencil.

**DIRECTIONS:**

When pencil becomes too short to write with comfortably, shave down the butt and screw into the Holder. The screw makes its own thread. Will hold the pencil perfectly firm.

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MANUFACTURER OF

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PATENT ELECTRIC-CORDAGE, CABLES, etc., etc.No. 20 CONDUIT STREET,  
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This is the ONLY one which which is perfectly suitable for all open circuit work such as Electric Bell ringing, hotel and house annunciators, burglar alarms, signals, laboratory experiments, etc., or wherever a battery is wanted which is clean, free from acids, always ready for use, and does not consume when not in operation.

IT LASTS, WITHOUT RENEWAL, FROM SIX MONTHS TO SEVERAL YEARS, according to use.

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For these reasons it is the only suitable and SAFE battery FOR BELLS, etc., in Private Houses where the Battery must BE CLEAN, RELIABLE, and always ready for use.

The electro-motive power of Grove being 100, this is 75, and Daniells 50; or three cells of this battery are equal to four cells of the Daniells.

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This system of Fire Alarm and Police Telegraph, with a Central Office, or upon the

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is now in operation in the following cities, to which reference is made for evidence of its great **SUPERIORITY, VALUE** and **UNIFORM RELIABILITY**;

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The introduction and operation of the  
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involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

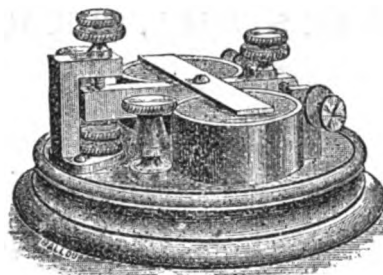
The co-operation of **TELEGRAPHERS** in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

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A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

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Improved.



PRICE, \$6.00.

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THOUSANDS IN USE.

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Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful little sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. PRICE, \$4.00.

No cast or malleable iron used in these instruments.

Sounder and Key, together. \$9.00.

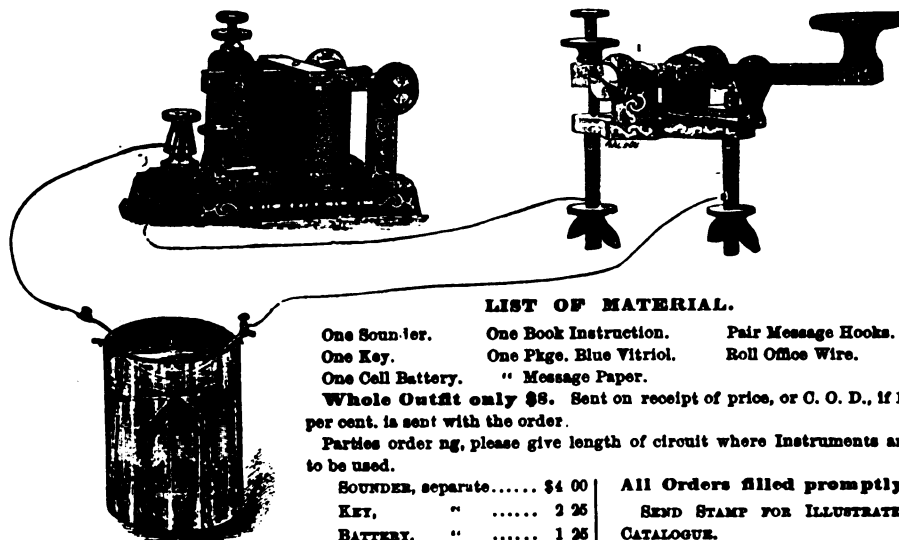
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One Sounder.	One Book Instruction.	Pair Message Hooks.
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Whole outfit only \$8. Sent on receipt of price, or C. O. D., if 10 per cent. is sent with the order.		
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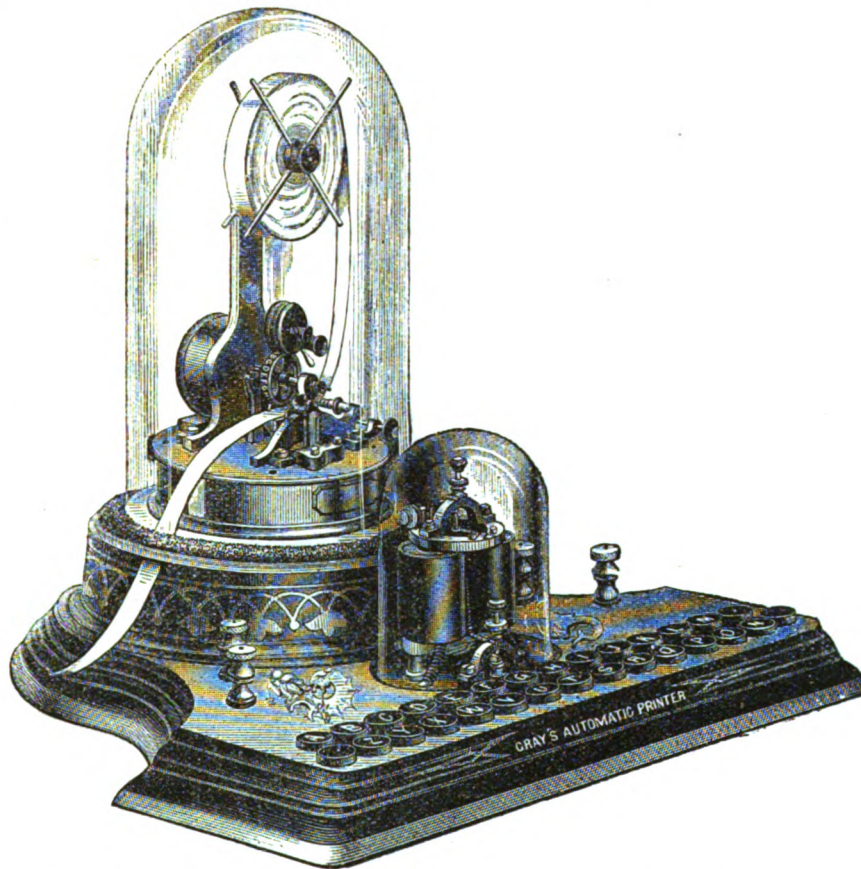
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Six transparent colors, beautiful designs.  
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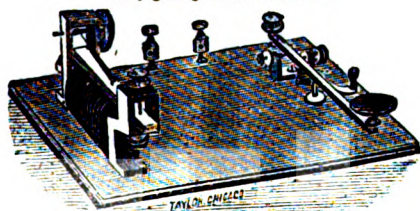
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NEW GIANT SOUNDERS PERFECTED.**

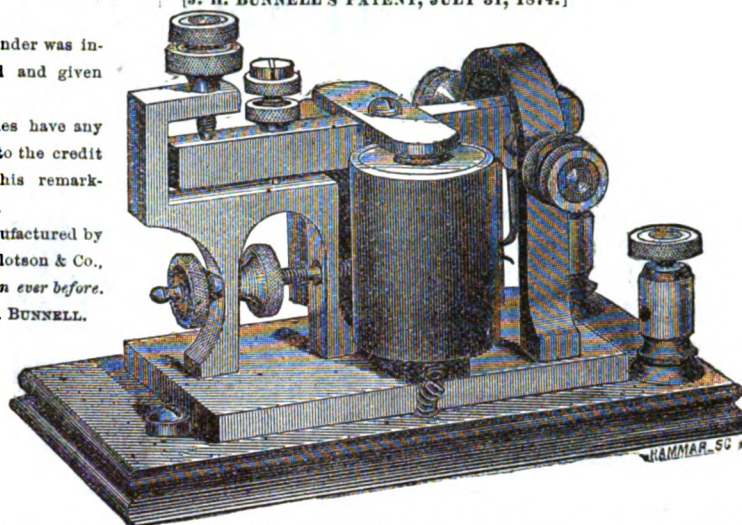
[J. H. BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was invented, patented and given its name by me.

No other parties have any claim whatever to the credit of originating this remarkable instrument.

It is being manufactured by Messrs. L. G. Tillotson & Co., more perfectly than ever before.

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Beautiful in appearance, highly finished, and put up in the most durable and substantial shape.

They give enormous sound with but little Local Battery power. Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder is desired.

**PRICE, \$7.50,**

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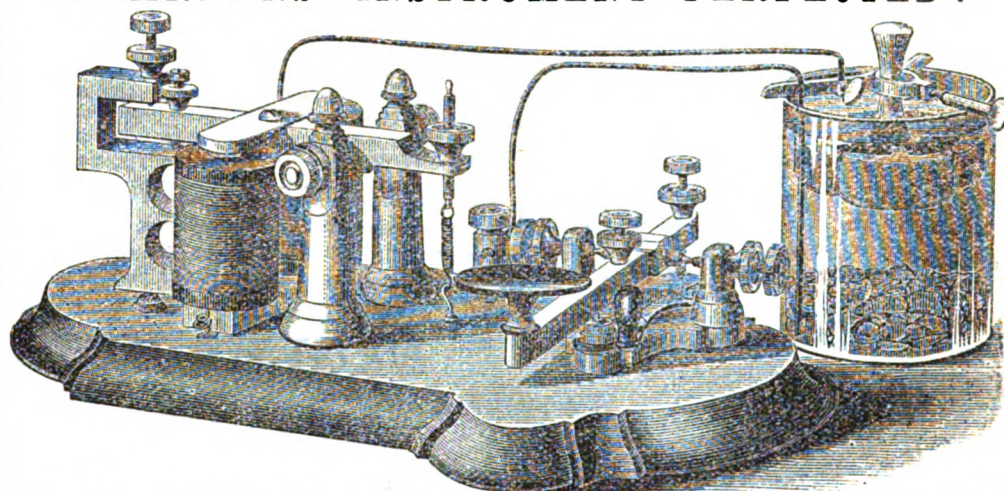
Cincinnati Agency, H. D. ROGERS & CO.,

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

**BUNNELL'S  
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[These instruments have been greatly improved in their working qualities and in the style in which they are finished. Those having the latest improvement in their construction are those manufactured only by Messrs. L. G. Tillotson & Co. JESSE H. BUNNELL.]

These Sets are made in the best manner, and are just exactly the thing wanted FOR LEARNERS' USES.

FOR TELEGRAPH SCHOOLS,

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Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials to put in operation, singly or on a short line . . . \$8 50  
Learners' Instrument, without Battery, &c., . . . 6 50  
Ornamental Learners' Instrument, Rubber Covered Coils, &c., . . . 7 50  
Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines up to twelve miles in length, \$1.00 in addition to above prices.

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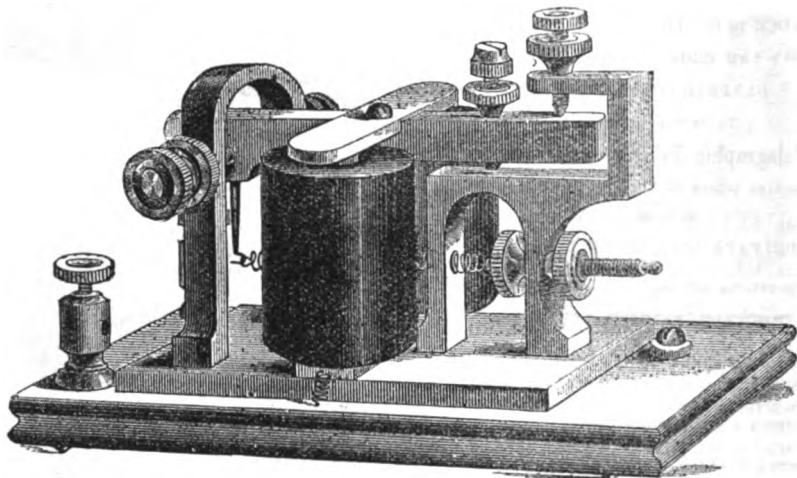
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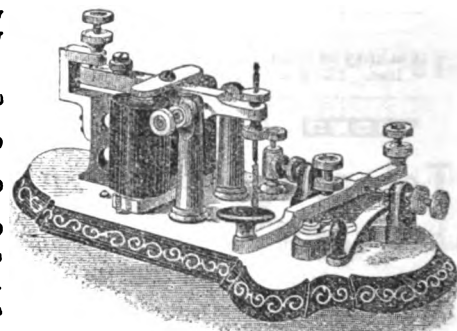
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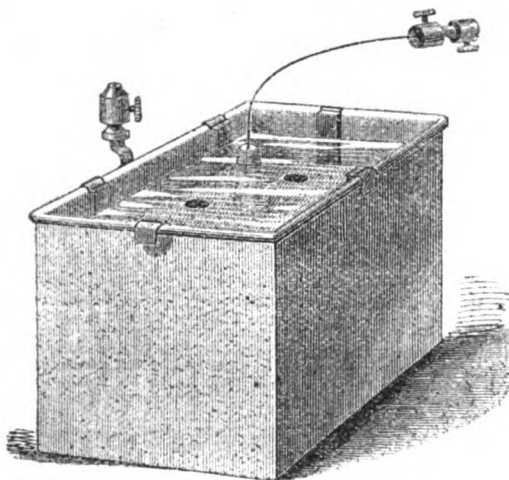
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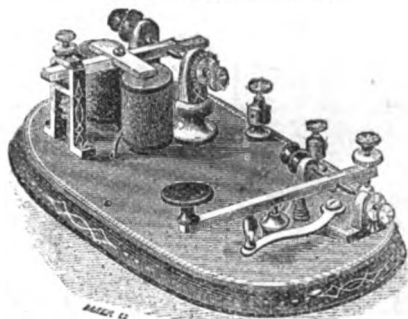
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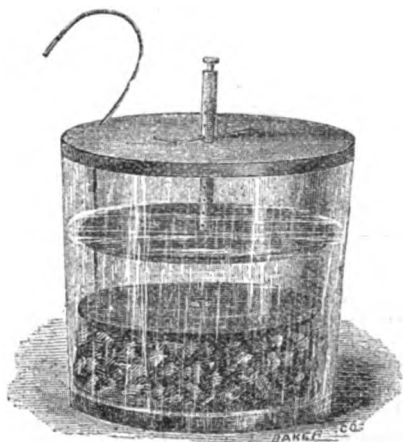
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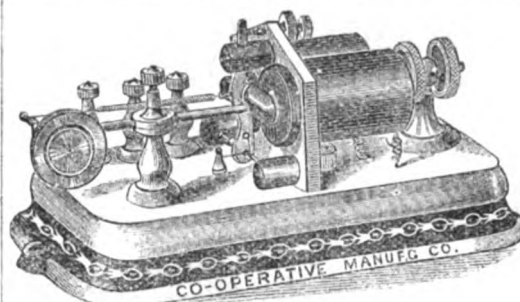
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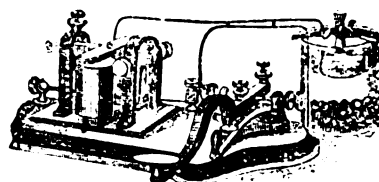
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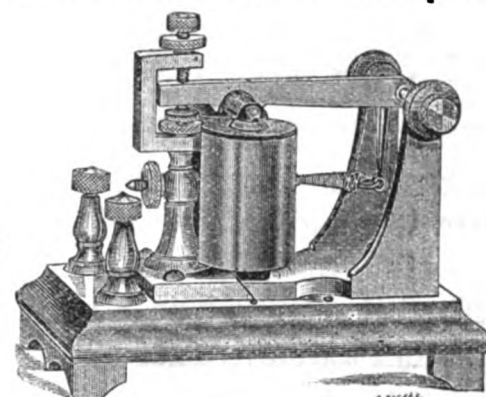
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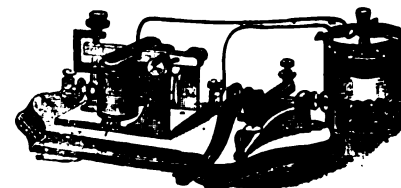
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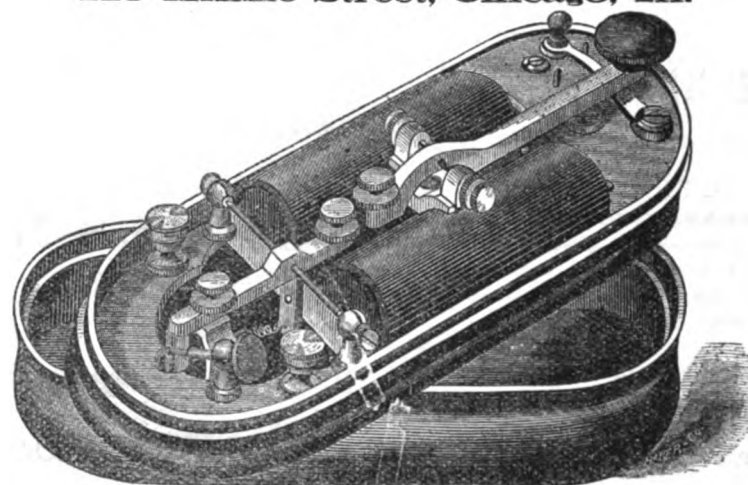
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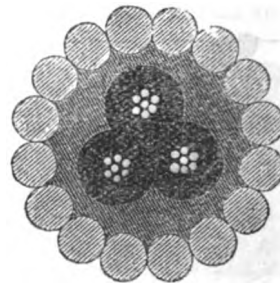
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# JOURNAL OF THE TELEGRAPH.

VOL. VIII. NO. 24.

NEW YORK, DECEMBER 15, 1875.

WHOLE NO. 195.

## DUPLEX TELEGRAPHY BY CONSTANT CURRENTS.

In most of the systems of duplex telegraphy hitherto invented or now in use, the open-circuit plan originally adopted by Gintl and Frischen has been made use of. The first duplex system in which the main batteries at each end of the line were constantly maintained in connection with it, but were placed with like poles toward each other when the apparatus was at rest, was patented in this country by Moses G. Farmer, as long ago as 1858. This system, at a more recent date was revived in a modified form by George K. Winter, an English telegraphic engineer residing in India, and was patented in Great Britain by him on the 1st of March 1873. (No. 761). We extract the following description of Mr. Winter's method, from his specification as filed with above patent:

"For duplex working I make use of opposing batteries, whereby the battery power required is little more than that required for single working, and the adjustment for compensating changes in the insulation of the line is simplified. At each end of the line the battery is permanently inserted with the same pole to earth in each case. The receiving instrument is inserted between the battery and the line at each end. At a point in the coil of the instrument much nearer to the battery end than the line end the wire is connected with one terminal of a key, the other terminal being connected with earth. The effect of depressing the lever of the key is to connect together these two terminals. A resistance coil may, if necessary, be inserted between the battery and the instrument."

"Figure 1 shows the general arrangement. A and B represent the two terminal stations.  $l$  is the line between them. At each station  $i$  is the receiving instrument;  $k$  is key;  $b$  the battery;  $e$  the earth connection and  $r$  a resistance coil. Suppose one-tenth of the wire of the instrument  $i$  is between  $k$  and  $r$  and nine-tenths between  $k$  and  $i$ ; let the resistance  $r$  be nine-tenths that of the line, and let us first suppose the insulation of the line to be perfect. If now the key at A is depressed the battery at A is on short circuit through the resistance and one tenth of the instrument. The current from the battery at B flows through the whole of the instrument at B, the whole of the line wire and nine-tenths of the instrument at A. Its action upon the instrument at A is antagonistic to that of the battery acting locally at that station, and as it has to go through about nine times the resistance, it has only about one-ninth of the strength of the current of the battery on short circuit at A, but as it has nine times as many convolutions of the instrument wire to pass through, the actions are just balanced, and the instrument at A is unaffected. At B, however, it is evident that

the whole of the battery acts through the whole of the coil of the instrument, and produces a signal accordingly, which is only slightly weakened by the insertion of the resistance  $r$ . When B communicates with A the matters are simply reversed."

"When both keys are depressed at once, the battery at each station acts locally, and the action on each instrument is only about one tenth less than the action of the whole of the battery, when after traversing the line, it acts upon the whole of the coil of the instrument as in single sending."

"Now suppose the insulation to become imperfect, there will be a slight current from each battery running through the instrument to line, and tending to produce a signal. All we have to do to remedy this is give the instrument a bias against making a signal equal and opposite to the effect produced by the leakage current. With most instruments this is

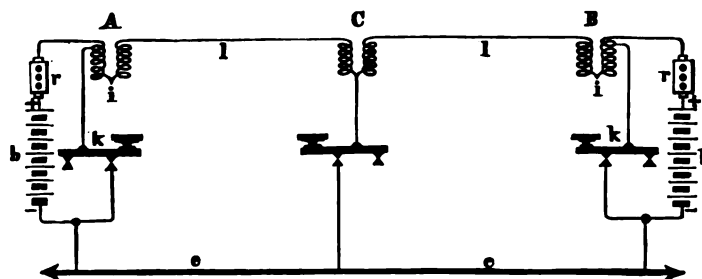


Figure 1.

done by the ordinary adjustment of the instrument with which the operators are already familiar."

"Another but less perfect arrangement, is shown in figure 2. In this arrangement, the key instead of being connected to a point in the wire in the interior of the instrument coil, is joined to a point in a resistance  $s$  acting as a shunt on the receiving instrument much nearer to the battery end of the shunt than the line end. A suitable proportion between the resistance  $s$  and the instrument coils is say 4 or 5 to 1. The

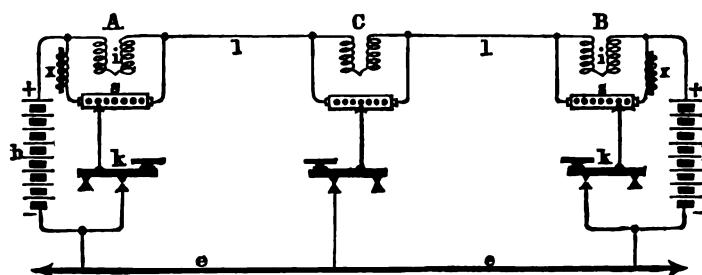


Figure 2.

point where the key is connected, may if required be made adjustable by means of a sliding contact."

"Both the above arrangements can be applied to intermediate instruments very simply, by making the point where the key is connected, nearer to the middle of the instrument coil in the first arrange-

ment, and of the shunt in the second method. The intermediate stations can then communicate with each other or the terminal stations in duplex and without batteries." The arrangements of the intermediate stations are shown in the figures.

"The effect of the static induction of the line in the opposed battery system is as follows:—When both keys are in their normal position the potential of the whole line is raised or lowered by the opposing batteries above or below that of the earth, and the line will in consequence hold a charge which will depend for its quantity upon the inductive capacity of the line. When either of the keys is depressed, the potential of the circuit at that point will be made the same as that of the earth, and half the charge of the line will flow out through the line coil of the instrument. In the second of the two systems, see fig. 2, the effect of the charge and discharge will be lessened by part being carried off by the shunt. It is evident therefore, that at each depression of the key, we have a strong instantaneous current flowing in one direction through the line coils of the instrument, whereas when the key is raised there is another instantaneous current flowing in the opposite direction through the whole coil." The effects of the inductive discharge when not compensated are on the whole much less marked in this, than in the open circuit system."

Mr. Winter's method of effecting the compensation for the inductive discharge, is by winding the shunt on the battery side of the key upon an iron core, as shown at  $x$  in fig. 2.

A recent number of *The Telegrapher* contains a description and drawing of a duplex system with opposed batteries, which will be found by comparison, to be identical in all its details with Mr. Winter's second method, as described in his English patent of 1873, which description has been given above. The invention is credited by the writer of the article referred to, to a Mr. D'Infrville, who, it seems, has patented it in the United States as an original invention, his application having been filed July 13, 1874, and issued December 8, 1874, the year following the patent of Mr. Winter.

It might very naturally be inferred at first sight, that this is one of the not infrequent cases of independent originality in the production of the same invention, were it not for the fact which is disclosed by a further search, that the same Mr. D'Infrville patented another duplex system in the United States, on the 17th of February, 1874, the identity of which with the first method described by Winter is no less remarkable than in the previous case.

We further learn from the same paper that Mr.

D'Inville has succeeded in selling his (?) invention to the Atlantic and Pacific Telegraph Company of the United States, and also to the Dominion Telegraph Company of Canada. If this statement is correct the fact forms a curious commentary upon the readiness sometimes exhibited by corporations to purchase what are claimed to be new inventions without apparently making the least attempt at an investigation into their actual originality. Even Mr. Winter, who is without doubt, the original inventor of the system which we have described, and which the officers of the above companies have been inveigled into purchasing from a party having no legal title to them, could not legally operate it in any country where Mr. Stearns' prior patents for his bridge duplex system, and for his method of compensating the static charge of the line by the use of electro-magnetic coils in the branch circuit, are in force, without the consent of the owners of these patents.

The action of our Patent Office in thus granting patents to applicants for inventions which have not only been patented abroad by others, but fully described in the printed reports of Foreign Patent Offices, and of allowing them the broadest possible claims for the same, as in the case above mentioned, is not an infrequent one, and calls for severe censure. Unprincipled adventurers are too often enabled to avail themselves of such opportunities to prosecute their schemes, to the discredit and detriment of worthy and meritorious inventors.

#### ON THE ACTION OF MAGNETS ON RAREFIED GASES IN CAPILLARY TUBES RENDERED LUMINOUS BY AN INDUCED CURRENT.

BY J. CHAUTARD.

The spectral modification produced by the action of magnets on the light of an induced current traversing rarefied gases are subject to very complex laws; and it is only possible to formulate them after varied and long-continued experiments. M. Tréve, in a Note published in the *Comptes Rendus* (January 3, 1870) after indicating some facts bearing on this class of phenomena, concluding in these terms—"coloration and declaration of the gases under the action of magnetism, and capillary parts of the tubes containing them;" but the experiments of the accomplished officer were not very numerous, they were made on only few gases, and appeared to be only indirectly connected with the researches he had undertaken. The subject seemed to be sufficiently interesting to be object of a fresh study, of which I have to-day the honor to present to the Academy a rapid summary.

*Conditions of the Experiments.*—Without returning to the experimental arrangements indicated in my first Note\*, I shall briefly analyze those which have permitted me to extend, and at the same time give a precise account of, my fresh experiments. These are:—the nature, temperature, and pressure of the gas; the intensity, direction, and the source of the induced current; the action of the magnet through the form of its poles, the energy and direction of the magnetization, the distance of the armature, and the axial or equatorial position of the tube containing the gas†.

(1) The rarefied gases or substances on which my experiments have been made are hydrogen, nitrogen, oxygen, carbonic acid, carbonic oxide, bicarburetted hydrogen, sulphur, selenium, iodine, bromine, chlorine, sulphurous acid, fluoride of silicium, bichloride of tin. All of them are far from presenting very pronounced modifications, as I shall presently show: the substances of the chlorine group are those most

sure to succeed, and produce the most brilliant results.

(2) Elevation of temperature lessens the effect produced by the magnet. This can be ascertained by causing the induced current to pass for some time within the tube: the heat resulting soon weakens and sometimes renders inactive the magnetic influence.

(3) The pressure of the gas interferes with the action of the magnet to such a degree that it is possible with the same substances to obtain, according to the conditions, either the sudden cessation of the induced current, or a notable modification in the luminous appearance, or the permanence of the initial tint.

(4) By varying the intensity of the induced currents, effects can be obtained similar to those which result from varying the pressure of the gas; in general, the more feeble the initial intensity, the more decided are the magnetic luminous modifications.

(5) The phenomena are the same when the induced current is derived from a Holtz machine or a Ruhmkorff induction coil.

(6) Both directions of the induced current, as also of the magnetization, give pretty nearly identical effects; certain substances, however, seem to undergo a more energetic influence at the moment of the reversal of the current.

(7) In form of the armatures, the surface ought chiefly to be considered; this should be plane, and such that the capillary tube will be embraced over the greater part of its length.

(8) It is evident that the more energetic the magnetization, the more pronounced will the phenomena be; it is usually determined with the aid of a pile of 12-15 Bunsen elements (large pattern).

(9) Lastly, the action diminishes rapidly with distance; this is ascertained by gradually removing the tube to about  $\frac{1}{2}$  centim. from the poles; beyond that limit the influence of the magnet ceases to be manifest.

*Conclusions.*—(1) The first result to be noted is an increase of resistance of the part of the induced current under the influence of the magnet. This resistance is sometimes such that the current may be suddenly interrupted at the instant when the magnet begins to act. This is made evident in the following manner. A tube is taken formed of two parts in communication, one of them presenting a constriction, the other a different length and diameter. The capillary part is placed in the pole of the electro-magnet, after which the current of the coil is started. As long as the magnet is inactive, the light circulates uniformly in the two tubes; it is suddenly arrested in the shortest and narrowest at the instance when this is submitted to the action of the magnet. The effect can be produced with chlorine, iodine, sulphur, selenium.

(2.) This cessation of the induced light caused by the magnet can be determined, with the same gas, in two quite distinct cases—either when exhaustion has been carried so far that the induction-current is near the limit which no longer permits it to pass, or, on the contrary, when the tension of the gas is sufficient for the spark to be near the same limit.

(3.) Under the magnetic influence the luminous thread, when it persists, undergoes in capillary tubes a narrowing which can sometimes be perceived by simple inspection. This narrowing is produced by an augmentation of resistance, sufficiently energetic at times to be accompanied by a change of tint in the tube, or even by a modification of the spectrum. In certain gases, such as hydrogen, nitrogen, carbonic acid, the influence of the magnet is hardly perceptible, and the modifications observed enter into the system of the primitive lines.

(4.) This narrowing, or the change of tint of the luminous thread, does not extend to more than half a centimetre from the poles; thus on taking a tube of sufficient length, by changing the height of the spectroscopic while the magnetization is going on, the normal spectrum (that produced by the light outside of the magnetic field) and the spectrum modified by the vicinity of the magnet can be successively seen.

(5.) In order to form a good judgment of the action of the magnet, it is necessary to manage so that the spectrum is not very bright at starting. As soon as the current passes in the electro-magnet, the lines appear in their splendor. The phenomenon is particularly successful, and gives the most perspicuous results with chlorine, bromine, chloride of tin, fluoride of silicium, and sulphuric acid.

(6.) Direct measurements have proved that, for these last substances, the new lines developed under these circumstances are distinct from those which characterize the normal spectrum of the same gas traversed by a sufficiently energetic induced current outside the range of a magnet.—*Comptes Rendus de l'Acad. des Sciences*, vol. lxxx. pp. 1161-1164.

#### A NEW ELECTRIC MACHINE.

The apparatus, by S. C. Tisley, consists essentially of an electro-magnet with shoes, forming a groove in which a Siemens armature is made to revolve; this is much the same as the original machine, made by Siemens and Wheatstone, but the difference occurs in the break or commutator; here there are two springs or rubbers employed in taking the current off from the commutator. The commutator consists of three rings; one of these rings is complete for three quarters of the circle, the other quarter being cut away; another ring is cut away three quarters, leaving the one quarter; and in between these two rings is a third ring, insulated and connected with the insulated end of the wire wound round the armature, on this center ring are projecting pieces, one a quarter of a circle and the other three quarters, so arranged as to complete the two outer circles. The rubber spring which comes into contact with the quarter of the middle circle is connected with the electro-magnet of the machine, and the armature is so arranged that at the time of contact the best magnetizing current is displayed. The other spring rubber is in connection with the wire on the armature during the other three quarters of its revolution; and this is connected with any external piece of apparatus required to be worked.

By this arrangement, the alternate currents being utilized, they are all in the same direction; and by the length of contact the whole of the current is obtained in the best condition for heating wires, decomposing water, giving an electric light, and other usual experiments.

At present a model machine has been constructed on this principle, the armature of which measures 5 inches long by 2 inches in diameter, on which is wound about 50 feet of cotton-covered copper wire, No. 16 B. W. G. The magnet has about 300 feet of covered copper wire, No. 14 B. W. G. the whole instrument, without the driving gear, weighs 26 lbs. with this apparatus 8 inches of platinum wire, of 0.005 inch diameter, can be made red hot, water is rapidly decomposed, etc.

The armature is constructed especially to prevent the accumulation of heat to which every class of dynamo-magneto-electric machine is liable. It is made in two halves, a groove of zigzag form being cast in each half; so that, when the two are screwed together, a continuous channel is maintained through the bearings for a current of cold water to pass during the whole time the machine is at work.

\* *Comptes Rendus*, Nov. 16, 1874, p. 1123.

† The form of my apparatus has not, up to the present time, enabled me to compare the effects resulting from these two positions.



## THE QUEENSLAND TELEGRAPHS.

The report on the condition of the Electric Telegraphs of Queensland for the year ending 13th June, 1875, shows that, under the active superintendence of Mr. Cracknell, considerable progress has been made. At the time of writing the report there were 3,678 miles of line, 4,975 miles of wire, 97 stations, and 210 officers. At the corresponding period of 1874 there were only 3,203 miles of line, 3,931 miles of wire, 74 stations, and 181 officers. The subjoined table shows the yearly progress since the opening of the line:—

TABLE SHOWING PROGRESS OF TELEGRAPH DEPARTMENT, YEAR BY YEAR, FROM 1861 TO 1874.

Year.	Miles of Line.	Miles of Wire.	No. of Stations.	No. of Offs. ; cers. transmitted.	Gross Receipts, Cash.	"O. H. S." Business.		Approximate of Free Business, Shipping, etc.		Gross Expenditure.		Population.
						£.	d.	£.	d.	£.	d.	
1861	1,691½	169½	7	13	5,678	122	12	1,652	5	34,267		
1862	1,691½	169½	7	18	16,833	701	12	3,560	13	46,077		
1863	221	221	8	21	19,219	1,445	6	5,662	13	61,640		
1864	298	298	11	25	27,246	1,445	6	6,084	12	71,096		
1865	1,042	1,131½	23	32	47,697	3,839	2	12,293	11	97,775		
1866	1,476	1,565	31	66	65,610	4,138	0	14,631	11	96,172		
1867	1,663	1,752½	33	66	66,143	4,138	0	15,382	6	99,846		
1868	1,722	1,811½	35	69	59,632	3,721	3	15,301	9	107,397		
1869	2,039	2,162½	41	74	70,112	3,721	11	17,191	12	109,897		
1870	2,132	2,221½	43	81	81,483	3,424	6	19,073	17	115,597		
1871	2,525	2,614½	51	91	82,630	3,684	11	24,081	8	133,566		
1872	3,039½	3,069½	59	122	121,398	5,386	12	27,776	8	153,600		
1873	3,016½	3,016½	73	180	156,268	7,039	13	35,668	17	163,507		
1874			90	201	311,019							

The cost of constructing the new lines has been somewhat greater than in former years, which Mr. Cracknell attributes to the enhanced price of material, scarcity of suitable labor, dearness of provisions, and also to the prosperous state of the Colony.

Meteorological and shipping reports have been forwarded free of charge; but as the shipping telegrams seem only to benefit ship-owners and agents, Mr. Cracknell recommends that they should in future be placed on the same footing as ordinary business; and charged for at current rates.

The several lines in Queensland have worked well during the year. North of Rockhampton communication was, however, suspended for some days in February and March this year, during the prevalence of a cyclone. The line was seriously injured at

Alligator Creek, near Yaamba, where the water rose 60 feet above the ordinary level, and submerged the wires.

During 1874 the cash collections of the Department, at all its branches, amounted to £21,396 6s. 6d.; value of all messages transmitted on Her Majesty's Service, £7,039 19s. 10d.; total revenue for the year, £28,436 6s. 4d. The expenditure was, for salaries, £23,272, 0s. 3d.; contingencies, £11,796 16s. 10d.; refundments to other colonies, £2,033 1s. 4d.; total, £37,101 18s. 5d.—showing that the expenditure exceeded the revenue by £8,665 12s. 1d.

Out of 88 stations, the revenue exceeded the expenditure at 10 only, these are—Brisbane, Rockhampton, Townsville, Maryborough, Toowoomba, Mackay, Stanthorpe, Ravenswood, Millicester, and Charters Towers.

In 1873 the tariff of 1s. per ten words, exclusive of address and signature, with 1d. for every additional word, was adopted; the intercolonial rates were also lowered; and to this cause Mr. Cracknell attributes the unsatisfactory condition of the financial department. He considers that the adoption of a low uniform tariff on the long lines of the colony is premature. It is, however, a question whether or not the actual money loss is compensated by the collateral advantages derived from the Service.

The international business dealt with by Queensland Stations is very small, owing to the high tariff, no reduction having been made in the rates since the line was opened. Only 395 messages were transmitted and received during 1874, being an increase of 55 on the previous year.

Regulation for the examinations of candidates were issued in June, 1874. Eight examinations have since been held, at which forty-four candidates presented themselves, of these twenty-five passed, twenty of whom have received appointments, and five are in the learner's room. There are twelve junior operators in the department, receiving salary at the rate of £100 per annum, who will be entitled to an increase of £20 per annum when they pass the examination.

We learn from the report that Wheatstone's automatic instruments, arranged for the duplex principle have been introduced by the New South Wales Department, for the purpose of increasing the capacity of their Intercolonial lines.

## THE NEW ZEALAND TELEGRAPHS.

This growing, enterprising colony has again put forward a satisfactory and prosperous report of its telegraphic operations during the year ending June 30th, 1875. The revenue was estimated at £55,000, but it has exceeded that amount by over £800. During the year 917,128 telegrams of all codes were transmitted, being an increase of 164,299, or more than 17 per cent. over the previous year. There is a balance of £9,460 13s. 4d. as interest upon the capital expended.

The number of telegrams transmitted during the year (917,128), compared with the number of interprovincial letters posted during the year, shows that 22.59 telegrams were sent for every 100 letters posted. The proportion is not quite so great as last year, but the fact that there is nearly one million increase on the number of letters posted as compared with the number of letters for the previous year will account for it.

To enable masters of vessels to ascertain the state of the weather prevailing at any port to which they might be bound, or at any intermediate port, the system of sixpenny telegrams, including reply, has been introduced. The facilities thus afforded, when

generally known, will doubtless be taken great advantage of by maritime men.

A like facility for obtaining news at a reduced rate was also granted to all Chambers of Commerce throughout the colony, who might be desirous of acquiring for public information the arrivals and departures of shipping at various ports. The consideration in this case asked for by the department was, that telegrams containing shipping intelligence the same being positively for public and not private information, be paid for at the rate of 3d. per telegram, for each vessel. This concession has not as yet been taken great advantage of, but will doubtless, with the general progress of the colony, be adopted to a considerable extent.

During the past year 456 miles of new lines, carrying a single wire have been erected, and 988 miles of wire have been added to the original lines, making a total addition of 1,444 miles of wire. There are now opened to the public throughout the colony 127 stations, 21 which have been opened during the past year, 6 being in the South Island and 15 in the North Island. The length of line maintained during the past year was 2,955 miles, the average cost for maintenance being £4 16s 4d. per mile. At the close of the year 2,986 miles of line, carrying 6,626 miles of wire, were in circuit, showing an increased mileage upon the previous year, of line 456 and of wire 1,444. The nominal strength of the department, including linemen and inspectors, on the 30th June, 1875, was 509, against 388 of the previous year.

The duplex system of telegraphy has been in successful operation on the No. 3 wire in the Cook Strait Cable since the 18th of June, 1874, and the advantage of speedy communication consequent thereupon has been very obvious. Instruments are now ready, and the system will be immediately introduced on the No. 3 wire north to Napier, and on the No. 3 wire between Blenheim and Christchurch. With the additional wires erected between Napier and Wellington, it is anticipated that this will greatly facilitate the transmission of the increasing work now offering.

It is proposed to introduce shortly the Automatic system on some of the longer circuits, instruments for this purpose having just arrived from England. It is proposed to lay a second single wire cable across Cook Strait, so as to have an alternative line in the event of the existing cable breaking down.

## DEEP SEA SOUNDING BY PHOTOGRAPHY.

Neumayer has presented to the Geographical Society of Berlin a remarkable photographic apparatus for determining the temperature and current-direction at any particular depth of the ocean. It consists of a brass box, hermetically closed, and having attached to it an apparatus resembling a vane or rudder. Within this box a thermometer and a magnetic needle are contained, behind each of which is placed sensitive photographic paper, and in front of which is a small nitrogen vacuum tube. The box contains also a small induction coil. When the apparatus is lowered to the required depth, the rudder causes it to take a direction parallel to the current there existing, and hence a definite direction with reference to the needle within. The thermometer soon acquires the temperature of the water outside, and becomes stationary. At this instant an electric current is sent to the box, which by means of the induction coil inside, lights up the little nitrogen tube, the violet light of which, photographically very intense, prints, in about three minutes, the position of the needle and the height of the mercury column upon the prepared paper. The current is then intermitted, the apparatus raised, the photographic tracing fixed, examined, and placed upon record.

APPLICATION OF THE MAGNETIC NEEDLE  
IN SEARCHING FOR IRON ORE.

The discovery of a considerable portion of the new mines in Sweden has been due to the facility of observing their action on the magnetic needle.

From the *Journal de Physique*, we learn that M. Thalen has recently conceived the idea of employing the magnetic needle not only to find the existence, but also, to a certain extent, the strength or quantity, the direction and depth below the surface, of masses of ore. M. Thalen effects this by measuring the intensity of the magnetic action, or rather of its horizontal component, at a series of points as near, and at as regular intervals as possible over the supposed mine. The measurement is made with a declination needle, and with the aid of a movable magnet which the observer can, at will, place in a fixed and invariable position with regard to the needle, or to remove it. At each point of observation, the needle is first brought to zero, the magnet being withdrawn. The magnet then being placed in its position, the angle of deflection is observed. The measure of the intensity of terrestrial magnetism, comprising that of the ore below the soil, can easily be deducted. A certain number of observations enable the observer to trace lines of equal intensity, called *isodynamic lines*, which are found to be disposed in two series of closed curves, surrounding with greater or less regularity the two points, which correspond to the greatest and the least deflection of the needle. Between those two series of lines is a line not closed, called the *neutral line*, and which corresponds to points where the magnetic influence of the mineral is nil.

The conclusions at which M. Thalen has arrived are:—The line which joins the maximum and minimum, and which may be taken as the magnetic meridian of the mine, indicates the general direction of the ore. The intersection of this line with the neutral denotes the point at which it is preferable to commence operations. And, lastly, the distance from the latter point to that of the magnetic meridian of the place, for which the deflection is minimum, gives half the distance from the center of the mass of ore to the surface. These two latter results are only applicable, if the depth of the ore under the surface is considerable.

## WEATHER-TELEGRAPHY.

From *The Telegraphic Journal*.

Every science has in its time to pass through three stages before it can be considered perfect. There is first the stage of observation, when as many facts as can possibly be gathered together are duly marshalled in their proper order; next comes the stage of reflection, when theory steps in and adduces order from apparent disorder by explaining away the darkness hanging over these facts, and by unravelling the causes which have led to them; finally, there is the prophetic stage,—the phenomena of the past and present being satisfactorily accounted for, those of the future can be foretold with certainty.

There can be no question as to which of these stages Meteorology is in at the present moment. Many there are who would gravely doubt if it will ever get beyond the stage of observation, yet those who are best qualified to judge can entertain only one opinion upon the subject, and that is that our present ignorance and consequent wide-spread superstition with respect to it cannot last long. The weather phenomena must yield to that irresistible spirit of enquiry which never yet has failed in eventually surmounting whatever difficulties it has attacked. Thus Sir John Leslie, in his work on

Natural Philosophy, says, "It cannot be disputed that all the changes which happen in the mass of our atmosphere, involved, capricious, and irregular as they may appear, are yet the necessary results of principles as fixed, and, perhaps as simple, as those which direct the revolutions of the Solar System. Could we unravel the intricate maze, we might trace the action of each distinct cause, and hence deduce the ultimate effects arising from their combined operation. With the possession of such data we might safely predict the state of the weather at any future period, as we now calculate an eclipse of the sun or moon, or foretell a conjunction of the planets."

To unravel this intricate maze by gaining possession of the data which are required, is the object of meteorology in its present stage. The initiative for this purpose in England was taken by the late Sir John Burgoyne, who as recently as the year 1852, proposed that land observations should be made by the Corps of Royal Engineers. Commodore Maury had been working at Washington for some time previously in the same direction, and the United States Government, on being consulted, expressed their entire willingness to co-operate in the scheme, and suggested that marine observations should be taken as well. Since then, the maritime nations have, one after another, taken up the idea, and throughout the whole civilized world at the present moment, not only are observers stationed at what have been considered to be the most advantageous points; but many of the steamship companies have lent their assistance to the work by allowing observations to be taken on board their vessels by competent observers with first-class instruments, and rendering these to the Meteorological Office upon their return.

To America belongs the credit of having been the first to suggest the employment of electric science, in the collection of these observations and in the utilisation of the results deduced from them when once obtained. As far back as the year 1846 we find Professor Redfield thus writing to the *American Journal of Science and Arts*: "In the Atlantic ports the approach of a gale may be made known by means of the electric telegraph, which probably will soon extend from Maine to the Mississippi." The idea thus originated was actually realised and carried into practical execution by Professor Henry and his assistants at the Smithsonian Institution between the years 1850 and 1855, and the subsequent impulse given to meteorology amongst the nations of Europe was unquestionably owing mainly to their exertions in this direction. In 1854, Le Verrier, in France, came to advocate the immense value of a system of telegraphic weather reports; whilst in 1861, in our own country, Admiral Fitzroy,—whose name will ever be inseparably associated with the science,—devised a code of meteorological telegraphy, instituted a regular service by means of which reports were received from various stations on the coast, and laid the basis of that weather study which, notwithstanding the innumerable difficulties it has to contend with, is day by day approaching a state of greater perfection. On the death of Admiral Fitzroy, an able successor was found in Mr. Robert Scott, under whose direction the Meteorological Office in London is now conducted. Daily weather reports are there received by telegraph from no fewer than fifty-one stations, extending from Haparanda, at the extreme north of the Gulf of Bothnia, to Toulon, on the shores of the Mediterranean; from Christiansund, on the western coast of Norway, to Corunna, in the northwest corner of Spain, and including The Skaw, Wisby (the capital of Gothland), Paris, Biarritz in the S. E. corner of the Bay of Biscay, Sumburgh Head in the Shetland Isles, Valencia,

Stornoway in the Hebrides, Hurst Castle in the Solent, etc., etc. The following particulars are sent from each of these at 8 A. M. daily:—The height of the barometer, the height of the thermometer in the shade, the direction and force of the wind, the amount of cloud, state of the weather, rainfall for the previous twenty-four hours and the sea disturbance. These are tabulated, and four charts, one for the barometer, another for the thermometer, a third for the wind and sea, and a fourth for cloud and rain, and drawn up from the data thus obtained, published and issued the same day. Incorporated with these are reports giving the same particulars at 2 P. M. on the previous day for nine stations.

Great as the service may be which electric science thus renders to meteorology in the collection of these observations, it renders a still greater practical service even now; and one which, as the science advances, will be more and more appreciated in giving timely warning of the approach of rough weather. For although no attempt has yet been made at a theoretical explanation of meteorological phenomena, there are certain valuable facts established from an observation of them. The motion and force of the winds, for instance, depend upon what has been named "the barometric gradient;" that is to say, if there is a difference in the height of the barometer at any two places a wind sets in between them with a force proportional to that difference; the area of depression again is found, as a general rule, to travel eastwards at an average rate of about thirty miles an hour. Thus it is, that as most of the storms which visit us are first of all felt upon the western shore of Ireland, timely warning of the approach of these can be given to the seaports on the Irish Sea, the English Channel, the East Coast, as well as to France and the eastern shores of the North Sea, all of which are warned of the expected approach of storms by our Meteorological Office.

The following statistics for the United Kingdom require no words added to them to show the good work done by our Meteorological Office in thus giving timely warning of the approach of nearly every serious storm to the seaport towns along the Coast:—

	Warnings justified by subsequent Gales.	Warnings justified by subsequent Strong Winds.	Total Warnings justified.	Warnings not justified by subsequent Weather.	Warnings late or partially late.
1870 .. ..	46.7	21.7	68.4	22.4	..
1871 .. ..	46.	17.7	63.7	22.	..
1872 .. ..	61.	19.5	80.5	11.9	..
1873 .. ..	45.2	34.	79.2	16.8	4 0
Total for 1873	250	118	85	42	10

For this reason many suggestions have been made as to the best means of obtaining information of these storms on their easterly journey. The Portuguese meteorologist have proposed furnishing observations from the Azores by means of the cable, which touches there. This has been declined on the ground that no connections can be discovered between the movements of the barometer at Valencia, our most westerly point of observation, and the Azores. The storms which pass over these islands take a south-easterly direction towards the African continent, and do not seem to approach us. Equally valueless was the proposal to receive information from the United States, for the character of the storms

becomes entirely changed after travelling over any considerable area of the earth's surface. The idea of placing large buoys at advanced points of observations off the Irish coast, and connecting them by wire with the main-land must likewise must be abandoned until some means of anchoring these in such deep waters have been devised.

In another important respect electrical science brings with it valuable aid to the science of meteorology. No great meteorological change takes place without it being accompanied by marked disturbances in terrestrial electricity, either in the air, in the earth, or in both. And simultaneous observations of these disturbances carried out in different quarters of the world, and now for the first time rendered possible by the development of electrical science would place in our hands the only means by which we can hope to get at some definite understanding respecting them. The theory of lightning and thunderstorms is now fairly understood; the aurora borealis, it is generally accepted, is the result of electrical discharge through the rarified strata of our atmosphere, comparable in every respect to the passage of electricity through the so-called vacuum tubes. The earth currents, on the other hand, which are constantly flashing to and fro through the crust of our globe, but which at times appear with far greater violence than at others, are still unintelligible and have in fact only of late years commanded the attention which they merit; the cause of the changes in terrestrial magnetism is likewise still wrapt in mystery.

Yet notwithstanding the many barriers which stand in the way, "no philosophical mind," to quote the words of Dr. Whewell, "can doubt the fixity of these rules which are followed by the causes ever at work in producing those changes of winds and skies." And when the day does come, as come it inevitably must, when these are perfectly understood, only then can the aid which the electric science has rendered be fully recognized.

#### TEST OF GALVANIZED IRON WIRE.

A recent test of six samples of galvanized iron telegraph wire gave the following results:

Length.	Weight.	Resistance.	Temp. 62° Fahr.
B 29.83 ft.	1.656 lbs.	.1577 Ohms.	
C 29.79 "	1.6473 "	.11367 "	
E 30.58 "	1.664 "	.0896 "	
M 29.47 "	1.5547 "	.11356 "	
O 31.375 "	1.719 "	.116 "	
S 29.04 "	1.5 "	.10621 "	

The resistances given above are the mean of two measurements, one made with Elliott's slide, and the other with Elliott's large box of resistance coils. The mean resistance in ohms per mile was as follows: B 27.91; C 23.69; E 15.47; M 20.35; O 19.52; S 19.31.

The weight of metal required per mile for one ohm is as follows: B 8180.21; C 6917.3; E 4446.31; M 5666.61; O 5647.7; S 5266.6.

The number of twists in six inches were as follows: B 32. C 15. E 16. M 19. O 15. S 22.

Breaking weight; B 1222 pounds; C 1100; E 900; M 935; O 1028; S 930.

Percentage of elongation. Length of wire tested six inches. B 18.23 per cent.; C 19.79 per cent.; E 7.36 per cent.; M 17.18 per cent.; O 15.63 per cent.; S 15.63 per cent.

#### THE PARIS ELECTRICAL EXHIBITION.

Finding it impossible to organize in so short a time the exhibition of all kinds of electrical and telegraphic apparatus, announced to be opened in Paris in December, the promoters have postponed the opening of the exposition until July, 1877, when it

will be opened at Palais de l'Industrie. Count Hallez d'Arros has been appointed Director-General, and the President of the French Republic is at the head of a Committee of Patronage.

#### THERMO-PILES.

At a meeting of the Physical Society at London on Nov. 13th, Dr. Stone read a paper "On Thermopiles." He has recently been engaged in some experiments with a view to ascertain the best alloy for use in thermopiles. The thermo-electric power of a metal or alloy appears to be quite unconnected with its power for conducting heat or electricity, or with its voltaic relation to other metals, neither does it appear to have any relation to specific gravities or atomic weights. The thermopiles employed were of a form slightly modified from that employed by Pouillet in his demonstration of Ohm's law. Alloys are frequently more powerful than elementary metals; thus, 2 parts of antimony and 1 of zinc have a negative power represented by 22.70, while that of antimony is 6.96 or 9.43, and that of zinc is 0.2. A strange exception, however, is that of bismuth and tin; for, while the power of pure bismuth is +35.08, when the two metals are alloyed in the proportion of 12 to 1, the power becomes -13.67. Dr. Stone first used a couple consisting of iron and rich German silver (that is, rich in nickel). This was characterised by great steadiness, but the electromotive force produced by moderate differences of temperature was not great. He then used Marcus's negative alloy, consisting of 12 parts of antimony, 5 of zinc, and 1 of bismuth, but the crystalline nature and consequent brittleness of this mixture were found to be great objections to its practical use. It occurred to Dr. Stone that the addition of arsenic might diminish the brittleness without injuring the thermo-electric power; and, on trial, it was found that an alloy of zinc, antimony, and arsenic, with a little tin, formed a much less brittle mass than Marcus metal, with quite as great, or greater, thermo-electric power. A set of twelve couples of this alloy and German silver was exhibited. The electromotive forces of this set, and of a similar one of 12 iron and German silver couples, were determined by Mr. W. J. Wilson, and found to be, for one alloy and German silver couple, with difference of temperature of 80° C., 1-108th of a Daniell's cell. The electromotive force of one couple of the iron and German silver set was 1-648th of a Daniell's cell. The ordinary method of applying heat by a trough of hot water is objectionable, for the water short-circuits some of the current. This is evident from the fact that, if oil heated to the same temperature be substituted, a considerable greater deflection is obtained. Another method suggested by the author, which would tend to economy, is to allow petroleum to volatilise in the neighborhood of one face of the pile, thus chilling it, and to ignite the mixture of air and gas so produced at the other face. Clamond's pile, consisting of iron and an alloy of zinc and antimony, was employed for some time, but, although good results were obtained, the iron is liable to rust at the connections.

Dr. Guthrie remarked that, in researches of this nature, the main object in view was to ascertain what relation, if any, existed between the direction of the current and the amount of heat flow. He referred to the experiment with a tangle of fine platinum wire, by which it is found that, if either end of the wire be heated, a current flows towards the tangle, and this takes place however well the tangle may be annealed. He suggested that the great effect which alloying one metal slightly with another has on its position in the thermo-electric series may, perhaps, be connected with its change in conducting power for heat.

Mr. Walenn referred to experiments which he made with a couple in which amalgamated copper was employed, some years since on the thermopiles when used at high temperatures. The most powerful currents were obtained with a volatilisation of the mercury. Subsequently he employed wires of wrought-iron and German silver, and, although the results were not specially remarkable at moderately high temperatures, the power became great when the connections were raised to a red heat.

Professor Foster called attention to Matthiessen's "Table of the Electric Conductivities of Metals and Alloys," in relation to the use of the latter in thermopiles. The fact shown by Matthiessen, that the conductivities of alloys are greatly influenced by changes of temperature, will probably, he considers, be found to have some connection with the thermo-electric action. He also mentioned, as a fact which should be remembered when considering the construction of thermopiles, that the presence of minute traces of impurity completely changes the electric conductivity of a metal.

#### THE ELECTRIC LIGHT AS A MILITARY SIGNAL.

The roof of the Siemens-Halske factory at Berlin, was recently the scene of a series of experiments with the electric light, which filled all the streets in the vicinity with a crowd staring with astonishment at a supposed wonderful natural phenomenon up in the clouds. The apparatus, which gave a light so powerful that ordinary writing could be read by its illumination at a mile distance, was arranged with an inclosed mirror, so that the rays were projected against the clouds, which served as a screen. In front of the mirror the signals were made, and these were repeated, of course on a gigantic scale, in the clouds. The light is to be adopted by the German army for night signaling.

The Signal Service Telegraph line from Wilmington to Smithville, N. C., mouth of Cape Fear river, a distance of twenty-five miles, has been completed.

#### FOREIGN ITEMS.

Advices from China, to Nov. 3d, states that the telegraph builders have again been driven from their work near Foochow, and the Amoy officials protest their inability to control the populace.

The traffic receipts of the Direct Spanish Telegraph Company for the month of October were £1,580, against £1,386 in the corresponding period of last year.

At the adjourned meeting of Hooper's Telegraph Works, the report of the committee of investigation was adopted, and it was proposed to raise about £50,000 on debentures.

The receipts of the Submarine Telegraph Company for the month of October, 1875, amounted to £10,918 against £9,910 for the corresponding month of last year.

The traffic receipts of the Great Northern Telegraph Company for the month of October amounted to 387,084 francs, against 420,885 francs last year; and the total traffic receipts, from 1st January to 31st October, amounted to 3,574,032 francs, against 3,784,825 francs last year.

The Eastern Telegraph Company's receipts for the month of October amounted to £35,750, against £32,853 in the corresponding period of 1874; and those of the Eastern Extension, Australasia and China Telegraph Company to £19,604, against £16,584 for the corresponding period last year.



## TARIFF BUREAU.

## SEMI-MONTHLY CIRCULAR.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
Broadway, cor. Dey street, New York, December 15, 1875.

To all offices on W. U. Lines:

The following changes and additions have been made since the date of the last circular:

## GENERAL INFORMATION.

266 Jacksonville, Ala., reopened.  
Wetumpka, Ala., closed. Messages for Wetumpka can be mailed from Montgomery.  
285 Wilhites, Ala., reopened.  
412 Argenta, Ark., reopened.  
Hereafter the "tariff for other lines" from Petaluma to Bolaga and Stewart's Point, Cal., will be 115 160 and 60 130 respectively.  
Castle Rock, Col., was incorrectly given in last JOURNAL as Castle Rock.  
Ashmore, Ill., closed.  
Chase, Ill., closed.  
446 Fenton, Ill., reopened, check Prophetstown.  
Comstock, Iowa, changed to Kirkville.  
464 California, Iowa, reopened.  
447 De Soto, Kas., reopened.  
Hereafter half rate messages will be taken for and received from Owensboro, Ky.  
Bedford, Mich., closed.  
Delhi, Ingham Co., Mich., changed to Holt.  
Utica Plank, Mich., changed to Fraser.  
Pappillion, Neb., is now a W. U. office, square 464. Check direct.  
Athens, New York, closed.  
Cassville Junc., N. Y., changed to Richfield Junc.  
\* North Bristol, O., changed to Oakfield.  
180 Olmstead Falls, O., reopened, will be open during the night only.  
Shiloh, Ohio, closed.  
Bark Lake, Ont., reopened.  
Limehouse, Ont., closed.  
Leslieville, Ont., closed.  
Northfield, Ont., closed.  
Oil Springs, Ont., closed.  
Point Farm, Ont., closed.  
Shead's Mills, Ont., closed.  
Houtzdale, Pa., is now a W. U. office square 102. Check direct.  
Carillon Wharf, Que., closed.  
Point Platon, Que., closed.  
\* Underhill, Vt., closed.

## NEW OFFICES.

\* Perry, Ga., 40 and 3 from Fort Valley.  
300 Allendale, Ill.  
336 Alta, Ill.  
327 Armington, Ill.  
326 Clarion, Ill., check Arlington.  
368 Ewbanks, Ill., check Fowler.  
329 Ledford, Ill.  
359 Ogles, Ill., check Belleville.  
317 Wards, Ill., check Sagetown.  
3-8 Donaldson, Iowa.  
397 Kirkville, Iowa, formerly Comstock.  
407 Knoxville, Iowa.  
455 Hawthorne, Iowa, check Red Oak.  
407 Durham, Iowa, check Knoxville.  
377 Lockridge, Iowa, check Glendale.  
455 Nodaway, Iowa, check Villisca.  
407 Tracy, Iowa, check Knoxville.  
417 Tyrone, Iowa, check Melrose.  
397 Whitfield, Iowa, check Batavia.  
200 Almont, Mich.  
240 Bennington, Mich.  
240 Holt, Mich., formerly Delhi, Ingham Co.  
204 Fraser, Mich., formerly Utica Plank.  
\* Ferris, N. B., 30 and 2 from Sackville.  
\* I. C. R. Coal Branch, N. B., 30 and 2 " "  
31 Island Trees, L. I., N. Y.  
\* Port Kent, N. Y., 30 and 2 from Whitehall, Montreal Co.  
33 Queens, L. I., N. Y.  
57 Richfield Junc., N. Y., formerly Cassville Junc.  
\* Oakfield, O. (formerly N. Bristol), 45, 3 from Ashtabula.  
\* Huntsville, Ont.  
\* North Williamsburg, Ont.  
\* Port Sydney, Ont.  
102 Ourwensville, Pa.  
151 Gibsonton Mills, Pa.

130 Grand Valley, Pa.  
\* St. Agatha, Que.  
\* Sault au Recollet Bridge, Que.  
145 Wedgefield, S. C.  
\* Eagle Pass (Ft. Duncan), Tex., 25 and 1 from San Antonio.  
\* Fort Duncan (Eagle Pass), Texas, 25 and 1 from San Antonio.  
\* Fort McIntosh (Laredo), Texas, 25 and 1 from Brownsville.  
\* Laredo (Ft. McIntosh), Texas, 25 and 1 from Brownsville.  
\* Roma, Tex., 25 and 1 from Brownsville.  
\* Cambridge Centre, Vt., 25 and 2 from Burlington.

## ATLANTIC CABLE.

The cable between W. Ladivostock and Nagasaki has been repaired, and the route via Siberia for messages to China, Japan, and points beyond thereby reopened. The following are the rates from London: Cochin China, Saigon, \$40.50; Singapore, \$42.50; Penang, \$46.50; Java, Batavia, and Weiterreden, \$48.00; West of Samarang, \$48.25; East of Samarang, \$48.75; South Australia, \$67.25; Victoria, \$67.75; New South Wales, \$68.50; Tasmania and Queensland, \$69.75. Rates via Siberia to China and Japan will be found in the tariff book.

WILLIAM ORTON,  
President.

## THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.

## RECEIPT OF ASSESSMENTS.

NEW YORK, December 10, 1875.

## ASSESSMENT No. 79.

2, 0 27, 98, 148, 175, 178, 237, 238, 242, 246, 258, 273, 274, 294, 312, 347, 361, 451, 453, 455, 457, 466, 468, 469, 470, 471, 475, 481, 514, 527, 542, 560, 594, 691, 692, 714, 725, 766, 787, 801, 813, 869, 873, 899, 920, 977, 1093, 1102, 1127, 1134, 1135, 1136, 1143, 1153, 1200, 1273, 1449, 1489, 1559, 1601, 1610, 1611, 1612, 1663, 1697, 1698, 1699, 1715, 1716, 1731, 1742, 1786, 1900, 1907, 1917, 1974, 1976, 2037, 2038, 2048, 2063, 2086, 2089, 2094, 2095, 2165, 2177, 2182, 2197, 2256, 2261, 2309, 2319, 2320, 2328, 2351, 2353, 2364, 2365, 2380, 2381, 2396, 2440, 2447.

## ASSESSMENT No. 78.

1144, 1160, 2376.

Members of the Association who look to the JOURNAL OF THE TELEGRAPH for receipt of assessments paid, will please take notice that an acknowledgement of the receipt of one assessment should be taken as a receipt for all previous assessments.

## THE TELEGRAPHERS' ASSOCIATION BALL.

The second annual reception and ball of the New York Telegraphers' Association, which is set down for Friday, Jan. 21st, 1876, at Ferrero's Assembly Rooms, promises to be one of the best of the season. Many of the most prominent telegraphers in the country are expected to be present. Parties who reside outside of New York, can procure tickets by applying to Mr. T. G. Singleton, Secretary of the Association, Western Union Building.

## PHOTOGRAPHIC VIEWS OF THE N. Y. OFFICE.

We are informed that there are a small number of Photographic Views of the New York office remaining unsold, which will be disposed of at very low prices. These Views are, first, a General View of the Operating Room, in two sizes—8×10 and 10×14, and, second, a View of the Switch, 8×10. The pictures are handsomely mounted on heavy card-board. Price of the large pictures \$1, and of the smaller ones 50 cents. They are published for the benefit of the Telegraphers' Insurance Association, and may be had by addressing Mr. William Holmes, the Secretary of the Association.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, December 9, 1875.

## EXECUTIVE ORDER No. 164.

The Executive Committee have directed the following reductions to be made in the rates of compensation payable to all officers and employes of this Company after January 1, 1876.

Salary of the President, 25 per cent.

All other salaries exceeding the rate of \$5,000 per annum, 20 per cent.

Exceeding the rate of \$2,500 per annum and including \$5,000—15 per cent.

Exceeding the rate of 1,200 per annum and including \$2,500—10 per cent.

Exceeding the rate of \$600 per annum and including \$1,200—5 per cent.

The compensation to which the reduction is applicable, will include that paid by the Gold and Stock Telegraph Company, and by the International Ocean Telegraph Company, in all cases where Western Union employes also receive compensation from either the Gold and Stock or the International Ocean Telegraph Companies, or both.

Whenever the reduction applied to any existing salary would bring the compensation into the class next below, then the reduction will cease at the maximum of such class below. For example: In the case of a salary at the rate of \$108.33 per month (\$1,300 per annum), the reduction will be but \$8.33 instead of \$10.33, leaving the compensation at \$100 per month, the maximum limit of the class next below.

Whenever the reduction at any rate herein specified leaves the fraction of a dollar less than one half it will stop at the even half dollar. Whenever the fraction is more than half a dollar the even dollar next above will be taken. For example: In the case of \$83.33 per month (1,000 per annum) the deduction of 5 per cent would leave the rate \$79.17, which will be made \$79.50. In case of a salary at the rate of \$92.50 per month, the 5 per cent reduction would leave \$87.88, which will be made \$88.00.

All officers and agents of the Company authorized to make payments to employes on account of salaries, are hereby directed to make the changes as above stated in the payment of all salaries above the rate of \$50 per month for services rendered after January 1, 1876.

WILLIAM ORTON,  
President.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, December 15, 1875.

All Franks issued by this Company during the year 1875, and now in force, are hereby extended until the 31st day of January, 1876.

NORVIN GREEN,  
Vice-President.

Mr. N. DeBree, Cable Manager at Key West, has found and repaired the fault in the 1873 cable between Key West and Havana.

## THE INTERNATIONAL OCEAN TELEGRAPH COMPANY.

The annual meeting of the stockholders of the International Ocean Telegraph Company, was held in this city on Tuesday, December 7th.

The gross earnings for the year ending October 31, were \$309,129.22, while the net earnings amounted to \$190,896.94. Dr. Norvin Green, Vice-President, stated that the business between this country and Havana had fallen off gradually during the past two or three years, but the through business to South American ports has increased to such an extent that the total earnings had been in excess of former years. The report further states that a new cable had been completed during the past year between Key West and Punta Rasa, thus furnishing duplicate cables, in working order, between Punta Rasa and Havana, touching at Key West; also that the new cables from Demarara to Para and from Para to Pernambuco were in thorough working condition.

The following named gentlemen were elected Directors for the ensuing year. William Orton, Norvin Green, E. S. Sanford, C. Livingston, Augustus Schell, A. B. Cornell, Harrison Durkee, Cyrus W. Field, and J. A. Scrymser.

At a meeting of the Board of Directors on Thursday, December 9th, William Orton was re-elected President, Norvin Green, Vice-President, R. H. Rocheser, Treasurer, C. Livingston, Secretary, and J. B. Van Every, Auditor. The Board also adopted a resolution reducing the salaries of all employees on and after January 1, 1876, on a sliding scale ranging from fifty to twenty-five per cent.

## SOUTHERN AND ATLANTIC TELEGRAPH COMPANY.

The annual meeting of the Stockholders of the Southern and Atlantic Telegraph Company was held in this city on Tuesday, Dec. 2d. About 12,000 shares of the capital stock were represented.

The report of the President of the operations of the company, during the year ending September 30th, showed the company to be in a more prosperous condition than at any previous time in its history, and that its lines had been extended to the principal places in the south, and that its business was increasing and profitable.

The following gentlemen were elected directors of the company for the ensuing year: Messrs. Charles F. Blossom, Henry Hentz, Francis Morris, Mathew Laury, Mayer Lehman, Charles M. Fay, Amerton Cole, T. T. Bryce, Philip Tabb, Seth B. French, Frederick Zerega, Ernest Bayer, B. G. Arnold, Lucas Hopkins, Eckstein Norton, J. T. Hanemann, Harry Morgan, Wm. Woodward, Jr., A. B. Graves, L. M. Calvocoressi, New York; Robt. N. Gourdin, Savannah, Georgia; J. B. Lafitte, J. T. Doswell, New Orleans, La.; John B. Palmer, Columbus, S. C.; F. E. Tollenwerck, Mobile, Ala.; John W. Burr, Montgomery, Ala.; C. H. Strong, Atlanta, Georgia; George H. Lazlehurst, Macon, Georgia; W. J. Middleton, Charleston, S. C.; W. F. Herring, Augusta, Georgia.

At subsequent meeting of the Board of Directors the following officers were unanimously re-elected—Charles W. Blossom, President; Henry Hentz, Vice-President; C. C. Blossom, Secretary and Treasurer; George F. Grace, General Superintendent.

## THE DIRECT CABLE BROKEN AGAIN.

The Managers of the U. S. Direct Cable announce that a break occurred to the cable on the evening of Dec. 10th, at a point about 130 miles east of Nova Scotia, and the *Faraday* will at once be dispatched to the spot for the purpose of repairing it.

## THE SERVICE.

## WESTERN UNION TELEGRAPH COMPANY.

OCTOBER, 1875.

## APPOINTMENTS.

T. Cair, B'way & Dey st.	C. T. Roberts, Ebensburg, Pa.
H. Cosgrove, "	O. Irons, Indiana, "
J. Newell, "	L. N. Hamilton, Oil City, "
J. P. Boyle, 520 Hudson st.	P. Bossart, Parkers, "
P. Mahoney, 1000 6th ave.	J. S. Gould, McKeesport, "
G. Y. Musson, 134 Pearl st.	L. L. Smith, Pittsburgh, "
Jennie Renode, Cooper Union,	J. B. Bryant, "
H. S. Martin, Harlem.	Wm. Smith, "
W. E. Webber, 407 Broadway.	L. W. Johnson, "
S. C. Allen, Stapleton, S. I.	R. E. Cuppige, Detroit, Mich.
D. E. Bartow, Garden City, L. I.	M. K. Moore, "
J. S. Cole, Cossackie St., N. Y.	Mrs. E. Ward, E. Saginaw, "
N. F. Chase, Montrose, N. Y.	J. M. Cronenbug, Erie, Pa.
S. Johnson, Pawlet, Vt.	E. R. Thompson, "
E. F. Lower, Creedmore, L. I.	H. Hatch, "
D. M. Lowerse, Flushing, "	F. C. Lecky, Postoria, Ohio.
T. M. Cawley, Carmansville, N. Y.	L. H. Higgins, Harrisonville, Mo.
J. H. Moore, Pearsall's Corner, L. I.	F. W. Lawlin, Jackson, Mich.
J. W. Page, Williamstown, Ma.	E. W. Andrews, Pontiac, "
S. Smith, Freeport, L. I.	E. Millar, Rogers City, "
J. M. Topping, Quogue, "	W. A. Davis, Three Rivers, "
F. Traphagen, Jamaica, "	J. Stanley, Jr., Unionville, "
J. E. Tallman, West Flushing, L. I.	F. A. Bradley, Ypsilanti, "
J. Walling, Great Neck, L. I.	W. A. Gibson, Logansport, "
A. Weeks, Lake Mahopac, N. Y.	C. H. Foster, Sup't, I. B. & W. R. R. Tel.
T. W. Greene, Boston, Mass.	B. M. Kinkaid, Cincinnati, O.
Mrs. Howard, "	D. H. Voorhees, "
F. A. Bradford, "	J. H. Wilkins, Newark, O.
D. J. Murphy, "	J. M. Bird, Vincennes, Ind.
H. Ziegler, "	J. M. Thurgood, "
S. C. Bassett, Cohasset Narrows.	W. H. Rains, Washington C. H., Ohio.
G. M. Eitmeier, Hartford, Ct.	D. June, Blodgett's Mills, N. Y.
R. W. Martin, Springfield, Ma.	W. M. Smith, Utica, N. Y.
H. W. Taylor, Tariffville, N. C.	G. F. Clarke, "
Wm. Stevens, Bedford, N. S.	A. D. Thompson, Oswego, N. Y.
D. M. Mumford, Ellershouse, N. B.	Celia A. Hall, Rochester, "
G. T. Ryan, Pictou Landing, N. S.	G. H. Bussey, "
Jno. McLaughlan, Pt. DuChene, N. B.	T. H. Bradley, Charlotte, N. C.
F. Forsyth, P't Williams, N. S.	W. H. Julian, Knoxville, Tenn.
L. J. Stevens, Wentworth, N. S.	R. K. Bailey, London, "
L. McKinnon, Whycomah C. B.	O. W. B. Franks, Lovington, Va.
L. F. Aldrich, Barre, Vt.	E. M. Love, Monroe, Va.
J. W. Waite, Fitchburg, Mass.	W. S. Williams, Mannington, W. Va.
F. L. Newhall, Nashua, N. H.	W. W. Boggess, Valley Falls, W. Va.
C. L. Ward, Proctorville, Vt.	H. F. Lines, Richmond, Va.
R. Nicourd, Milwaukee, Wis.	J. L. Watkins, Williamson, Va.
A. R. Warren, Pekin, Ill.	E. T. Krebbs, Wilson, N. C.
W. B. Jones, Quincy, "	S. W. Sanford, Brownsboro, Ala.
J. C. Frame, U. S. Yards, "	W. M. Davison, Scottsboro, Ala.
Otto Leder, Chicago, "	Mrs. M. P. Randall, Hopkinsville, Ky.
Miss M. J. Fitzpatrick, Chicago, Ill.	J. H. McDermott, Dyer, Tenn.
H. S. Wood, Newton, Kansas.	A. K. Cameron, Memphis, "
J. E. Grace, Cimarron, N. M.	Wm. Jurey, Paynes, Ky.
J. Griffith, Canon City, Col.	James Roy, Stanton, Tenn.
J. F. Stansifer, Dallas, Texas.	M. Manow, Canack, Ga.
B. Brewer, Dennison, "	C. M. Buttrfield, Macon, Ga.
W. H. Thomas, Galveston, "	L. M. Williams, "
R. W. Irwin, "	— Montgomery, Bogue Chitto.
C. Altum, Houston, "	G. H. Pendawis, Chrystal Sp'gs, Miss.
W. C. Moore, "	J. P. Eason, Batesville, Miss.
W. H. Wooding, Kansas City, Mo.	B. R. Grandberry, Montgomery, Ala.
Wm. L. Jones, Leavenworth, Kansas.	R. G. Raoul, Oayka, Miss.
C. G. Wright, Lawrence, Kas.	H. L. Strickland, 62 Mile Siding.
G. E. Baldridge, "	W. A. Edwards, Summit, Miss.
G. E. Fletcher, Puebla, Cal.	J. H. Doughty, "
F. W. Farley, Shreveport, La.	John Lang, Tangipahoa, La.
F. Linchtemeyer, Sedalia, Mo.	S. W. Ware, Cape May City, N. J.
T. J. Herbel, St. Louis, Mo.	M. F. Tomlinson, Germantown, Pa.
S. W. Ziegenfus, Shreveport, La.	A. Shug, Jenkintown, Pa.
J. P. McClure, St. Louis, Mo.	Ira S. Wolcott, Lykens, Pa.
J. W. Stacey, "	John Bilger, Middleburg, Pa.
J. C. McIlwaine, "	W. B. Berrett, Stelton, N. J.
P. Grischolt, "	J. L. Mingle, Philadelphia, Pa.
C. J. Lawson, "	S. L. Nicholson, Mobile, Ala.
C. E. Dougherty, "	C. H. Patch, New Orleans, La.
C. E. Riehle, "	C. H. Smith, "
C. D. Andrews, "	J. W. Bullock, Muscogee City, Fla.
A. Thunberg, "	E. F. Walker, Pensacola, Fla.
S. B. Frasee, "	W. K. Woolf, Okolona, Miss.
M. Ryan, "	G. W. Sutherland, Plantersville, Ala.
H. M. Byern, "	M. D. Thurman, Hoganville, Miss.
H. T. Small, "	J. J. McNulty, Wahalak, Miss.
John Nold, "	R. S. Haynie, Suckamore, Miss.
A. E. Hunt, "	Jennie Bachelder, Tuskegee, Ala.
Laura Bell, "	W. C. Benton, Sarulia, Ala.
W. H. Austin, Cheyenne, Wy.	A. F. Brannon, Montevallo, Ala.
T. A. Steel, Ft. Fetterman, "	
J. W. Dodd, Ft. Hall, Idaho.	
J. S. Baker, Hilliards, Wy.	
T. Nicholson, Shippensburg, Pa.	

## RESIGNATIONS.

W. S. Glassey, B'way & Dey st.	B. T. Brien, 1205 Broadway.
Mary Mitchell, "	W. H. Howard, 134 Pearl st.
W. A. Seymour, "	W. A. Redfield, St. Nicholas Hotel.
H. D. Shultz, "	F. Adams, Williamstown, Miss.
J. S. Coolbough, Harlem.	A. M. Briggs, Montrose, N. Y.
T. J. Gregg, 407 Broadway.	A. R. Bouton, Garden City, L. I.
C. Jones, 50 Pine st.	T. Cummings, East New York.
H. S. Knapp, 14 Broad st.	H. W. Chamble, Dix Island.
F. S. Wales, 554 3rd ave.	J. E. Crimpton, Flushing, L. I.

J. H. Cummings, Albany, N. Y.	J. Greene, East Saginaw, Mich.
S. Hensburg, Albany, N. Y.	— Mayre, Erie, Pa.
G. W. McGinness, Jamaica, L. I.	F. Low, "
F. C. Noble, Saratoga, N. Y.	John Beck, Berkeley Springs, W. Va.
O. B. Parker, Albany, N. Y.	W. Va.
H. F. Powell, White Plains, N. Y.	J. E. Alexander, Parkersburg, W. Va.
G. C. Smith, Pearsall's Corner, N. Y.	W. Va.
J. Traynor, W. Flushing, L. I.	E. W. Meeker, Postoria, Ohio.
J. Whitman, Freeport, L. I.	L. A. Colwell, Harrisville, Mich.
J. Walling, Creedmore, "	W. E. Baker, Jackson, Mich.
E. A. Boardalee, Saratoga, N. Y.	A. Molitar (dead), Rogers City, Mich.
Miss N. M. Allen, Boston, Ma.	G. W. Foster, Three Rivers, Mich.
W. F. McGrath, "	H. C. Marvin, Unionville, Mich.
H. W. Taylor, "	E. J. Marshall, Evansville, Ind.
Mrs. P. Hewins, Cohasset Narrows.	J. P. McClure, Cincinnati, O.
W. T. Stone, Hartford, Ct.	E. T. Applegate, "
J. Corcoran, Jr., Springfield, Mass.	P. J. Foley, "
C. H. Watson, Tariffville, Ct.	J. M. Spencer, "
S. H. Chute, Bedford, N. S.	D. B. Roushe, Newark, Ohio.
Miss P. J. Martelle, Cow Bay, C. B.	G. W. Andrews, Vincennes, "
J. McDonald, Ellershouse, N. B.	Thos. Donahue, "
Miss Bessie Eaton, Liverpool, N. S.	C. H. Ohio.
Miss M. Cowie, Liverpool, N. S.	J. W. Walker, Horseheads, N. Y.
T. J. Morrison, Morrison's Mills.	G. F. Clark, Utica, "
A. C. Stevens, Pictou Landing.	Lydia Tanner, Millport, "
H. B. Fleming, Ft. DuChene.	E. Bean, Skaneateles Falls, "
C. F. Lewis, Wentworth, N. S.	M. M. Smith, Utica, "
Henry Coombs, Burlington, Vt.	E. B. Thompson, Oswego, "
J. F. Stevens, Fitchburg, Ma.	J. H. Z. Demarest, Demarest, N. Y.
A. Ross, Proctorsville, Vt.	R. K. Bailey, Allegheny Sp'gs.
F. Pitcher, Milwaukee, Wis.	E. T. Erebbas, Blue Ridge, "
C. E. Butts, Pekin, Ill.	C. E. Williams, Charlotte, N. C.
S. Gaunt, U. S. Yards, Ill.	A. C. Taylor, Covington, Va.
W. S. Manners, Chicago, Ill.	J. C. Callum, Hot Springs, Va.
Miss Ada Patrick, "	J. W. Ward, Knoxville, Tenn.
J. E. Quinn, "	W. H. Julian, London, "
A. W. Parks, Newton, Kansas.	A. G. Soules, Covington, Va.
Geo. Roper, Cimarron, N. M.	G. W. Barnes, Monroe, "
Thos. Griffith, Cannon City, Col.	E. H. Bradley, Montgomery W. Springs.
W. B. Simmes, Dennison, Tex.	W. W. Gibbs, Rockridge A. Spa.
A. L. Smalley, "	J. E. Polts, Warm Springs.
W. H. Morris, Houston, "	J. W. Haynes, Williamson's, Va.
F. Smith, "	J. C. Borden, Wilson, N. C.
J. C. McIlwaine, Leavenworth, Kansas.	John Snodgrass, Scottsboro, Ala.
C. N. Hart, Lawrence, Kansas.	Miss M. H. Park, Hopkinsville, Ky.
Geo. Fletcher, "	J. A. Torrance, Louisville, Ky.
C. D. Snyder, Pueblo, Col.	W. Ford, Taylor, Tenn.
J. L. Morris, Shreveport, La.	W. H. Deage, Stanton, Tenn.
A. Brewer, Sedalia, Mo.	B. F. Pierson, "
D. H. Voorhees, St. Louis, Mo.	W. Benton, Macon, Ga.
R. J. Nicoud, "	C. B. Slacolon, Claymont, Del.
H. C. Lucking, "	W. C. Davidson, Batesville, Miss.
P. Carroll, "	C. Elzey (dead), Bogue, Chitto.
J. W. Delap, "	Miss.
C. McWilliams, "	J. J. McNavin, Chrystal Sp'gs, Miss.
Wm. Cartwright, "	W. G. Christian, Oayka, Miss.
J. Van A. Carter, Fort Bridger, Wyo.	J. P. Eason, 62 Mile Siding.
W. H. Murphy, Fort Fetterman, Wyo.	C. C. Prince, Summit, Miss.
F. Mashkoff, Ft. Hall, Idaho.	W. A. Edwards, Summit, Miss.
J. E. Van Winkle, Hilliards, Wyo.	J. W. Ferris, Tangipahoa, La.
E. J. McCurdy, Gt. Belt City, Pa.	J. S. Davidson, Bedford Sp'gs, Pa.
J. Irons, Indiana, Pa.	B. E. Wright, Germantown, Pa.
O. Irons, McKeesport, Pa.	H. B. Rudolph, Kennedyville, Pa.
E. W. Wells, Oil City, "	Isaac Runkel, Sykes, Pa.
J. S. Gould, Parkers, "	M. H. Dixon, Reading, Pa.
Z. T. Miller, Pittsburgh, Pa.	W. O. Duncan, Philadelphia, Pa.
A. B. Connelly, "	S. Q. Sevin, New Orleans, La.
C. C. Klump, "	E. F. Walker, Okolona, Miss.
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S. O. Holmore, St. Nicholas Hotel,	12 W. 23rd St.
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J. McKeuzie, Madison Square,	12 West 23rd St.
W. G. G. McGowan, 689 Broadway,	
W. Taylor, Long Branch,	St. Nicholas Hotel.
W. E. Tice, West Point,	Broadway & Dey St.
T. Williams, Saratoga,	
A. Wohlrobe, Madison Square,	12 W. 23d St.
J. W. Wood, Lake Mahopac,	Broadway & Dey St.

## MARRIED.

BROWN-MASSEY.—On Wednesday, November 17, 1875, at the residence of the bride's parents, South Bend, Ind., by Rev. H. M. Morey, Frank G. Brown, manager W. U. Tel. Office, to Miss Annie Massey.

GROFF-SMITH.—At Bethlehem, N. J., November 6, 1875, Geo. F. Groff, late operator at Wilkesbarre, Pa., to Miss Kate Smith of Bethlehem.

## Journal of the Telegraph.

This Journal is issued on the 1st and 15th of each month. Its circulation is over 8,000. It goes to every State, Territory and Province on the Continent. It has become a necessity, and is always welcome as a friend. No better medium for advertising exists.

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A reasonable discount will be allowed on advertisements to remain standing, for which special arrangements can be made.

NEW YORK, DECEMBER 15, 1875.

### CLOSE OF VOLUME VIII.

With this issue, Volume VIII of the JOURNAL OF THE TELEGRAPH is brought to a close. We believe that it will compare favorably with any preceding volume. No expense has been spared in its preparation, and its position as the standard American authority on telegraph subjects has been fully maintained. Nothing will be left undone in the future to preserve its high and valuable character.

Many subscriptions expire with the close of the volume. Those who are desirous of keeping posted in current telegraphic information will do well to renew at once. Employees of the Western Union Company are entitled to receive the paper for one dollar per year, which is one half of the regular subscription price.

Owing to delay in getting the material ready to put down, the Western Union Telegraph Company have decided not to attempt to lay the pneumatic tubes and underground wires between their general office and the branch offices on Broad and Pearl streets until early in the spring. The work could not be conducted to advantage during the severe winter weather now soon to be expected. No part of the plans regarding the experiments contemplated, however have been changed.

Managers of offices will please take notice that all communications relative to check error deficits with Oak Bluffs, Mass., should be addressed to C. F. Wood, Supt., Boston.

In transmitting the President's message from Washington to New York on Thursday, Dec. 7th, the Western Union Company used eighteen wires and the time occupied was 30½ minutes. The message contained about 13,000 words and copies were dropped at Baltimore and Philadelphia.

### THE PRESIDENT'S VIEWS UPON OCEAN TELEGRAPHY.

In his annual message the President makes extended reference to the subject of ocean telegraphy. Upon one point embraced in the reference the President has evidently been well advised, but upon others, the position he assumes is, to say the least, somewhat surprising. When, in 1869, the President refused to allow the French cable to be landed on our shores until the offensive and unjust restrictions against the United States or its citizens contained in the concession granted to that Company by the French Government were removed, the President assumed a position at once sound and incontrovertible and which met with public approval and commendation. The same approval will not be met in the position now assumed when he says that in the future, unless otherwise directed by Congress, he will refuse to allow the landing of any cable on our shores which is not in some effective manner, to the satisfaction of this Government, prohibited from consolidating or amalgamating with any other cable line, or from combining therewith for the purpose of regulating and maintaining the cost of telegraphing. The public will not be slow to see that this position is neither tenable nor lawful, and in attempting its enforcement the President would exceed his constitutional prerogative. It is moreover unjust. A case can readily be imagined of a line which is not doing sufficient business to meet its working expenses, to say nothing of interest upon the necessarily large investment of capital. In this emergency, the proprietors, desiring to be rid of such unprofitable property, find their only customer in a rival concern in similar difficulties. They are debarred by the attitude of the President from uniting their property and by diminution of operating force or other means augmenting their earnings, and so both must continue to operate their lines separately and at a loss, or else entirely abandon them; in the latter case depriving the public of facilities which are now indispensable.

The position taken with regard to the rates to be charged for transmission by any new cable company is, if possible, still more indefensible. It is no part of the duty of the President to prevent the landing of any cable which will not enter into a satisfactory arrangement in regard to its rates. There is the same amount of justice in this assumption of power as would be found in refusing to allow a vessel to land or carry away passengers or merchandise at rates upon which the Government had not been consulted.

The President will do well to abandon this untenable position which is as offensive to right and justice as were the conditions of the French concession which he successfully opposed and for which he received due credit. In competition and in the operation of the laws of trade telegraph tariffs will be better regulated than they could possibly be by any arbitrary governmental action. And this method of regulation will be better appreciated by the public, who ordinarily do not view with pleasure government interference in private business arrangements.

### THE NEW FORCE.

The "new force" claimed to have been discovered by T. A. Edison, may be demonstrated in the following manner:

Upon an insulated table place an ordinary Morse key and an electro-magnet, the coils of which are so wound that no magnetism is produced in its cores by the passage of an electric current. Use for an armature a piece of the metal cadmium, to one end of which fasten a flat spring. The other end of the spring attach rigidly to a standard fixed on the table. Adjust the armature a short distance away from the core of the magnet. The standard is to be connected by wire to one end of a glass rod or tube, say two feet long. The other end of the tube connect by wire with a graphite point (a lead pencil will answer). Another graphite point is connected by wire to a gas pipe or other suitable mass of metal, not in contact with the apparatus, and the two points, in position similar to the arrangement for producing the electric light, may be placed in a box from which light is excluded, but with a hole in the top for observation. Place 10 or 15 Bunsen cells in circuit with the key and the coils in the usual manner. Now, if the key be closed, a spark of considerable brilliancy will be evolved from the graphite points, but possessing no continuity. If, however, (the battery circuit remaining closed), any part of the connection between the gas pipe and the cadmium is broken, and contacts be made either slowly or rapidly between the disconnected points, the spark re-appears at each contact. It is here that the phenomena are surprising, and apparently unexplainable. The graphite is not in the battery circuit, nor in any other. Moreover it is separated from the rest of the apparatus by the glass tube. This alone would seem to prove that the force is not electrical, at least as the term is generally understood, and when supplemented by the fact that the most delicate galvanometer and the most sensitive of chemicals to the electric current fail to note its presence, this conclusion must be accepted. Many experiments have been made with a view to obtaining some definite knowledge, but nothing has been developed beyond the facts above stated, and in addition, that like electricity the new force passes through or over some substances better than it does over others, and also that as the resistance of one of its best known conductors is increased by length, the spark decreases in brilliancy.

The occurrence of this spark has frequently been observed by electricians whilst conducting experiments, but heretofore no attempt has been made to discover the cause or effect. Any theory upon the subject is, of course, at present wholly speculative, but it is not improbable that the phenomenon is in some degree the physical manifestation of that mysterious magnetic power which is not obstructed by material obstacles and is weakened only by separation. This view is supported by the analogy existing between two demonstrated facts: first: When the new force is conducted through the human body from points attached to both sides of the neck, the spark is of a certain strength. When the connection



tion is through the trunk, from hand to hand, the strength is greatly diminished.

Second: Substances which act as dielectrics, offer no obstruction to the passage of magnetic power. The action of a magnet upon a needle is the same when separated by a thickness of glass or porcelain, as when separated only by a distance of air equal to the thickness of the dielectric, and is diminished only by wider separation.

#### PRESIDENT ORTON'S SEMI-ANNUAL REPORT.

The semi-annual meeting of the Board of Directors of the Western Union Telegraph Company, was held on Wednesday, December 8th. The following is the report of the President and the resolutions adopted by the Board.

EXECUTIVE OFFICE,  
WESTERN UNION TELEGRAPH COMPANY,  
NEW YORK, December 8, 1875. }

##### To the Directors:

The Executive Committee submit the following statement concerning the operations of the Company for the current six months.

The gross receipts for the quarter ended September 30th were.....	\$2,671,805 93
Expenses.....	1,762,652 45
Net profits.....	\$909,153 48
The gross receipts for the current quarter ending Dec. 31st inst. (estimating the December business) are.....	\$2,538,160 26
Expenses.....	1,694,531 84
Net profits.....	843,628 42
Total profits for the half year.....	\$1,752,781 90
The amount required for two quarterly dividends of two per cent. each, is.....	1,351,200 00
Deducting which from the profits for the half year leaves a balance of.....	\$401,581 90
Deduct for six months interest on the bonded debt and for sinking fund accruing during the same period.....	275,000 00
Leaves a net balance of.....	\$126,581 90
The excess of net profits for the current half year over the same period for 1874, is.....	\$94,451 48

In view of the foregoing statements the Executive Committee recommend the adoption by the Board of Directors of the following:

*Resolved*, That a dividend of two per cent. from the net earnings of the three months ending December 31st be and the same is hereby declared payable on the 15th day of January next.

*Resolved*, That for the purpose of such dividend the stock books be closed at three o'clock on the afternoon of the 20th instant and be reopened on the morning of the 17th of January.

The Committee also report that a further reduction of the expenses of the Company is to be effected by carrying out a plan recommended by the President, whereby the compensation payable to all officers and employees of the Company in excess of the rate of \$600 per annum is to be reduced on and after the first day of January next on a sliding scale—from twenty-five to five per cent.

WILLIAM ORTON,  
President.

It affords us great pleasure to announce the appointment of Mr. James D. Reid to the position of Secretary and Treasurer of the Gold and Stock Telegraph Company, which office had been vacant since the resignation of Mr. H. H. Ward on Nov. 15. Mr. Reid entered upon the duties of his new position on December 1st.

#### THE PRESIDENT ON OCEAN TELEGRAPHY.

The President's Message contains the following in relation to Ocean Telegraphy:

"The electric telegraph has become an essential and indispensable agent in the transmission of business and social messages. Its operations on land and within the limit of particular States is necessarily under the control of the jurisdiction within which it operates. The lines on the high seas, however, are not subject to the particular control of any one government. In 1869, a concession was granted by the French government to a company which proposed to lay a cable from the shores of France to the United States. At that time there was a telegraphic connection between the United States and the continent of Europe (through the possessions of Great Britain at either end of the line), under the control of an association which had, at large outlay of capital and at great risk, demonstrated the practicability of maintaining such means of communication. The cost of correspondence by this agency was great—possibly not too large at the time for a proper remuneration for so hazardous and so costly an enterprise. It was, however, a heavy charge upon a means of communication which the progress in the social and commercial intercourse of the world found to be a necessity, and the obtaining of this French concession showed that other capital than that already invested was ready to enter into competition with assurance of adequate return for their outlay. Impressed with the conviction that the interests, not only of the people of the United States, but of the world at large, demanded or would demand the multiplication of such means of communication between separated continents, I was desirous that the proposed connection should be made. But certain provisions of this concession were deemed by me to be objectionable, particularly one which gave for a long term of years the exclusive right of telegraphic communication by submarine cable between the shores of France and the United States. I could not concede that any Power should claim the right to land a cable on the shores of the United States, and at the same time deny to the United States or to its citizens an equal right to land a cable on its shores. The right to control the conditions for the laying of a cable within the jurisdictional waters of the United States to connect our shores with those of any foreign State, pertains exclusively to the government of the United States under such limitations and conditions as Congress may impose. In the absence of legislation by Congress, I was unwilling on the one hand to yield to a foreign State the right to say that its grantees might land on our shores, while it denied a similar right to our people to land on its shores, and, on the other hand, I was reluctant to deny to the great interests of the world and of civilization, the facilities of such communication as were proposed. I therefore withheld resistance to the landing of any cable, on condition that the offensive monopoly feature of the concession be abandoned, and that the right of any cable which may be established by authority of this government to land upon French territory, and to connect with French land lines and enjoy all the necessary facilities or privileges incident to the use thereof, upon as favorable terms as any other company, be conceded. As the result thereof, the company in question renounced the exclusive privilege, and the representative of France was informed that understanding this relinquishment to be construed as granting the entire reciprocity and equal facilities which had been demanded, the opposition to the landing of the cable was withdrawn. The cable, under the French concession, was landed in the month of July, 1869, and has been

an efficient and valuable agent of communication between this country and the other Continent. It soon passed under the control, however, of those who had the management of the cable connecting Great Britain with this Continent, and thus whatever benefit to the public might have ensued from competition between the two lines was lost beyond having the greater facilities of an additional line, and the additional security in case of accident to one of them. But these increased facilities and this additional security, together with the control of the combined capital of the two companies, gave also greater power to prevent the future construction of other lines, and to limit the control of telegraphic communication between the two continents to those possessing the lines already laid.

Within a few months past a cable has been laid, known as the United States Direct Cable Company, connecting the United States with Great Britain. As soon as the cable was reported to be in working order the rates of the then existing consolidated company were greatly reduced. Soon, however, a break was announced in this new cable, and immediately the rates of the other line, which had been reduced, were again raised. This cable, being now repaired, the rates appear not to be reduced by either line from those formerly charged by the consolidated companies. There is reason to believe that large amounts of capital, both at home and abroad, are ready to seek profitable investment in the advancement of this useful and civilizing means of correspondence. They await, however, the assurance of the means and conditions on which they may safely be made tributary to the general good. As these cable telegraph lines connect separate States, there are questions as to their organization and control, which probably can be best if not solely settled by conventions between the respective States. In the absence, however, of international conventions on the subject, municipal legislation may secure many points which appear to me important, if not indispensable, for the protection of the public against the extortions which may result from a monopoly of the right of operating cable telegrams, or from a combination between several lines.

*First*—No line should be allowed to land on the shores of the United States under the concession from another Power which does not admit the right of any other line or lines formed in the United States to land and freely connect with and operate through land lines.

*Second*—No line should be allowed to land on the shores of the United States which is not by treaty stipulation with the government from whose shores it proceeds, or by prohibition in its charter, or otherwise to the satisfaction of this government, prohibited from consolidating or amalgamating with any other cable telegraph line, or combining therewith for the purpose of regulating and maintaining the cost of telegraphing.

*Third*—All lines should be bound to give precedence in the transmission of the official messages of the governments of the two countries between which it may be laid.

*Fourth*—A power should be reserved to the two governments, either conjointly or to each, as regards the messages despatched from its shores, to fix a limit to the charges to be demanded for the transmission of messages.

I present this subject to the earnest consideration of Congress. In the meantime, and unless Congress otherwise direct, I shall not oppose the landing of any telegraphic cable which complies with and assents to the points above enumerated, but will feel it my duty to prevent the landing of any which does not conform to the first and second points as stated, and which will not stipulate to concede to this government the precedence in the transmission of its official messages, and will enter into a satisfactory arrangement in regard to its charges."

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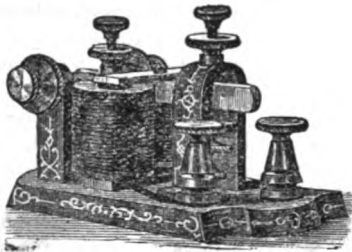
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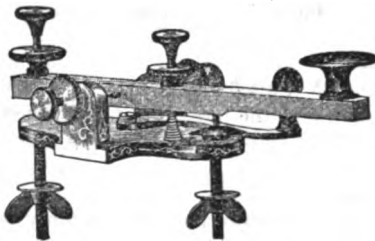
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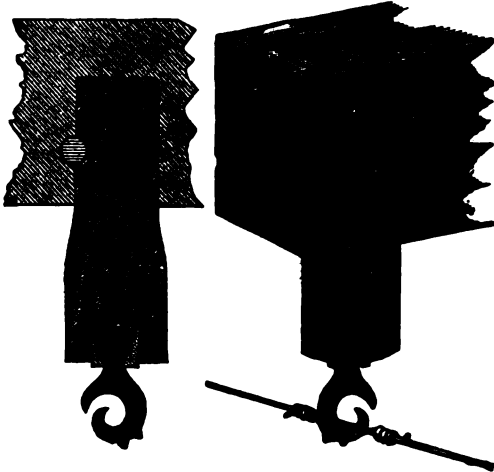
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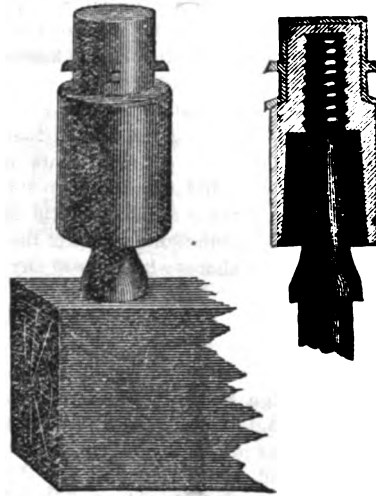
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*Second*—The AUTOMATIC REPEATER, through which the apparatus may be distributed in a combination of circuits, and the entire system successfully worked, without constant personal attention of either operators or watchmen.

*Third*—The ELECTRO-MECHANICAL BELL STRIKERS, adapted to produce the full tone of the largest church or tower bells.

*Fourth*—The ELECTRO-MECHANICAL GONG STRIKER, for hose and engine-houses, by means of which the location of the fire is instantaneously communicated to the members of each fire company.

These features combined form the

ONLY PERFECT, COMPLETE AND RELIABLE SYSTEM

OF

**FIRE ALARM TELEGRAPH IN THE WORLD.**

Messrs. GAMEWELL & CO. are the owners of the original FARMER AND CHANNING PATENTS, one of the most important of which has just been extended for seven years. During the past seventeen years they have spared no expense or efforts to secure improvements, and the systems are now covered by

MORE THAN TWENTY PATENTS,

The introduction and operation of the

AUTOMATIC SYSTEM

involves so little expense, compared to the benefit which it confers, that even small communities can profitably adopt and maintain it.

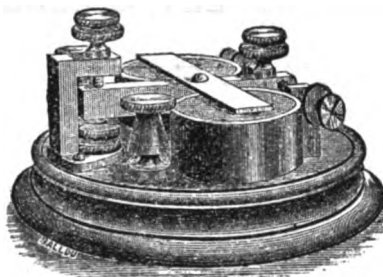
The co-operation of TELEGRAPHERS in securing its introduction into their localities is cordially invited, and their efforts will be duly appreciated and compensated.

Any information desired in regard to the above system will be cheerfully and promptly furnished on application at the office.

A pamphlet, setting forth more fully its advantages and superiority, has been printed, and will be supplied to Municipal Authorities and others interested in Fire Alarm and Police Telegraphy, upon application as above.

**LITTLE MONITOR**

Improved.



PRICE, \$6.00.

THE FINEST SOUNDER MADE.

THOUSANDS IN USE.

THEY SELL THEMSELVES.

Magnets full-sized, with polished Rubber Covers, nicely finished and made of best material. They give a cracking good sound and are generally acknowledged the most beautiful little sounder made.

A Splendid Little Monitor Key to match, which is a splendid instrument in every respect. Price, \$4.00. No cast or malleable iron used in these instruments.

Sounder and Key, together, \$9.00.

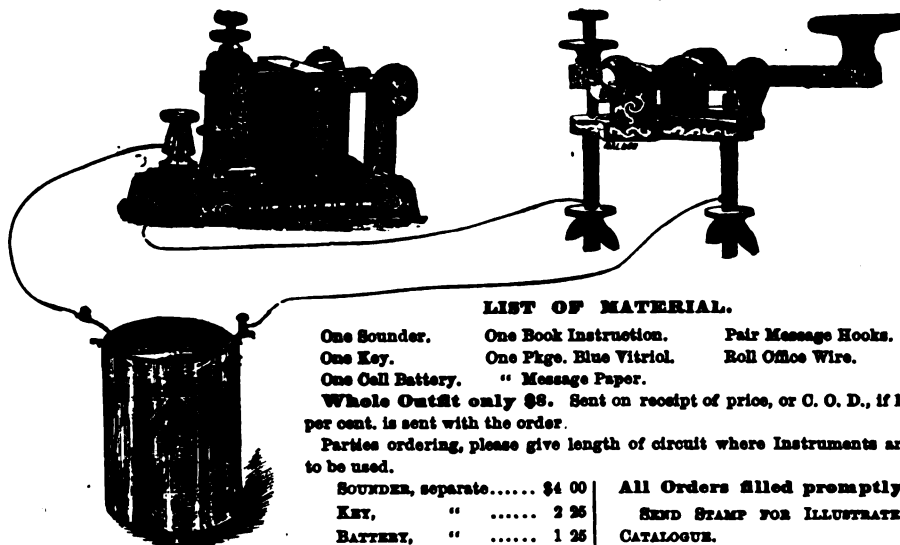
Orders filled promptly and sent on receipt of price, or C. O. D., if 10 per cent. accompanies the order.

**M. A. Buell & Sons,**

86 Bank Street, Cleveland, O.

**THE EUREKA INSTRUMENT.**

A COMPLETE SET FOR OFFICE USE.

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One Sounder.	One Book Instruction.	Pair Message Hooks.
One Key.	One Pkg. Blue Vitriol.	Roll Office Wire.
One Call Battery.	" Message Paper.	
Whole Outfit only \$9. Sent on receipt of price, or C. O. D., if 10 per cent. is sent with the order.		
Parties ordering, please give length of circuit where Instruments are to be used.		
SOUNDER, separate.....	\$4 00	All Orders filled promptly. SEND STAMP FOR ILLUSTRATED CATALOGUE.
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TELEGRAPH ENGINEER,

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AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES. Offer the best guarantee of excellence in their profession—in their long established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them, now almost universally adopted or imitated—and in the extent of their Business, domestic and foreign, enabling them to keep pace with telegraphic progress. They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

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Weekly Mail Steamship service between

PHILADELPHIA AND LIVERPOOL,

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The following Steamers are appointed to sail from Philadelphia.

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PRICES OF PASSAGE IN CURRENCY.

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Steamers marked with a star do not carry intermediate, Passenger accommodations for all classes unsurpassed. For passage, rates of freight and other information apply to

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FROM ANTWERP.

For Philadelphia.

For New York.

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Manufacturers and Dealers in Electrical Goods and Apparatus,

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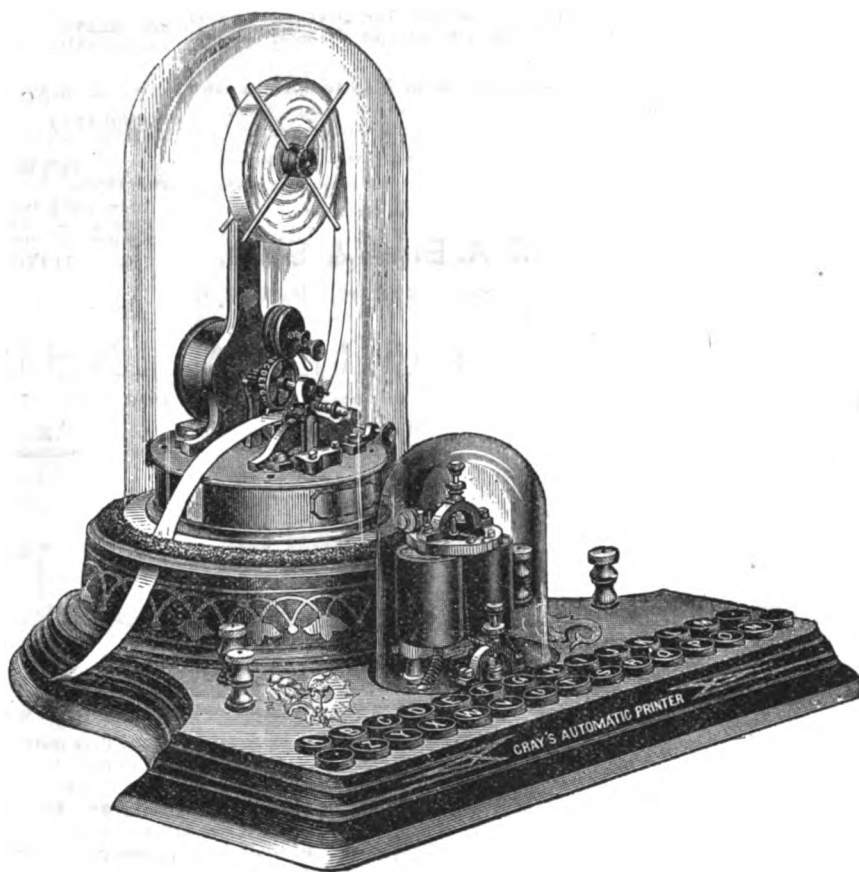
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Our facilities for the Manufacture of Electrical Apparatus are unrivalled.

We invite correspondence and solicit Patronage.

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**GENERAL COMMERCIAL NEWS REPORTS**

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**PRIVATE TELEGRAPH LINES**

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As manufacturers of all the perfect TELEGRAPHIC PRINTING INSTRUMENTS in use, and owners of a large number of Patents, we are prepared, under the facilities of our contracts with the WESTERN UNION TELEGRAPH CO., to extend our system of COMMERCIAL REPORTS and PRIVATE LINES to all parts of the UNITED STATES.

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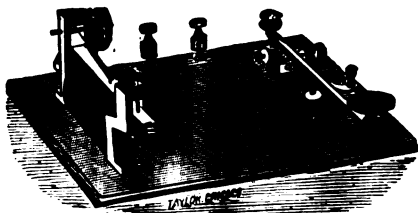
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Comprises SOUNDER, KEY CUP OF BATTERY, CHEMICALS, WIRE AND MANUAL.

Several thousand of these instruments already sold,

They give good satisfaction.

**PRICES:**

AMATEUR OUTFIT, COMPLETE, No. 1.	-	-	-	\$7 50
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" BATTERY, PER CELL.	-	-	-	65

**DISCOUNTS.**

TWENTY PER CENT. DISCOUNT WILL BE ALLOWED  
WHEN REMITTANCE ACCOMPANIES ORDER.

**GEO. H. BLISS & CO.,**

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## BUNNELL'S NEW GIANT SOUNDERS PERFECTED.

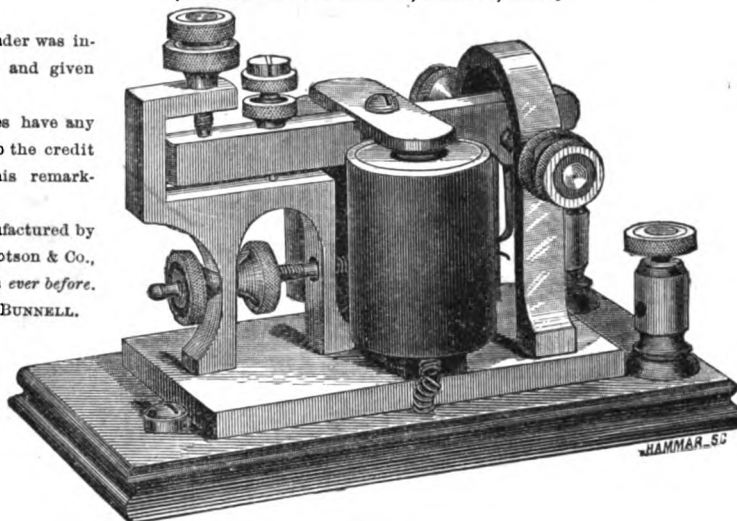
[J. H. BUNNELL'S PATENT, JULY 31, 1874.]

The Giant Sounder was invented, patented and given its name by me.

No other parties have any claim whatever to the credit of originating this remarkable instrument.

It is being manufactured by Messrs. L. G. Tillotson & Co., more perfectly than ever before.

JESSE H. BUNNELL.



Beautiful in appearance, highly finished, and put up in the most durable and substantial shape.

They give enormous sound with but little Local Battery power. Hundreds of them are in use in Railway and Commercial Telegraph Offices, and all operators agree that no better Sounder is desired.

**PRICE, \$7.50,**

subject to 20 per cent. discount where money is sent in advance either by postal order or draft.

**L. G. TILLOTSON & CO.,**

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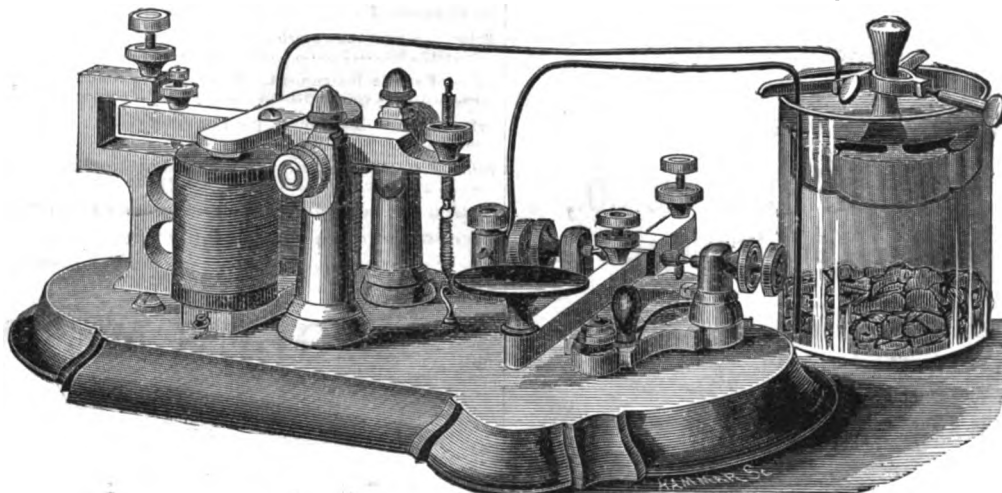
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8 Dey Street, New York,

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL.

## BUNNELL'S LEARNERS' INSTRUMENT PERFECTED!



**Complete and Perfect, full-sized Sounder and Key complete, with Book of Instruction, Battery, Wire and all necessary Materials.**

[These instruments have been greatly improved in their working qualities and in the style in which they are finished. Those having the latest improvement in their construction are those manufactured only by Messrs. L. G. Tillotson & Co. JESSE H. BUNNELL.]

These Sets are made in the best manner, and are just exactly the thing wanted FOR LEARNERS' USES.

FOR TELEGRAPH SCHOOLS,

Or FOR SHORT LINES, from a few feet to 12 miles long.

Price, complete, with Battery, Book of Instructions, Wire, and all necessary materials to put in operation, singly or on a short line . . . . . \$8 50  
Learners' Instrument, without Battery, &c. . . . . 6 50  
Ornamental Learners' Instrument, Rubber Covered Coils, &c., . . . . . 7 50  
Same Instruments, wound with finer silk-covered Wires, so as to operate satisfactorily lines up to twelve miles in length, \$1.00 in addition to above prices.

A copy of Smith's Manual, new and enlarged edition (See advertisement in another column) sent with each complete outfit of BUNNELL'S PERFECTED LEARNERS' INSTRUMENT.

These Prices subject to our usual discount of 20 per cent. where money is sent in advance, either by Postal Order or Draft.

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DEALERS IN EVERY DESCRIPTION OF TELEGRAPH MATERIAL

## A SUPERIOR PRINTING TELEGRAPH INSTRUMENT,

For Private and Short Lines.

*Awarded the First Premium—Silver Medal—over all others at Cincinnati Industrial Exhibition, 1872.*

The undersigned is now preparing to supply the improved and superior

**PRINTING TELEGRAPH INSTRUMENTS** manufactured under the patent of Mr. J. H. SELDEN. This instrument has already been extensively introduced, and has given complete satisfaction to all who have adopted and used it. It is **SIMPLE, RELIABLE**, and not liable to get out of order; can be operated by any person of ordinary intelligence after a few minutes' instruction and practice.

### PRIVATE LINES

constructed in the best and most substantial manner, and on reasonable terms.

Favorable arrangements will be made with line constructors, telegraph employees, &c., for the introduction of the Printer.

For further particulars, terms, &c., apply to

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INSTRUMENT AND OFFICE WIRES,

FLEXIBLE CORDS, CABLES,

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WIRES OF EVERY VARIETY OF INSULATION.

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TELEGRAPH INSTRUMENTS AND SUPPLIES in great variety, of the latest patterns and highest finish.

Prices always as low as the lowest.

The usual twenty per cent. discount is still allowed on Instruments of our manufacture, when remittance accompanies order.

**GEO. H. BLISS & CO.**

### The "Snapper" Sounder.



PATENTED MARCH 2, 1875.

Unpolished, 25c. each; \$2.00 per dozen; \$1.25 per half dozen.

Polished, 30c. each; \$2.50 per dozen; \$1.50 per half dozen.

Nickel-plated base, screw fastenings, 50c. each.

**PRICE 75 CENTS.**

Nickel-plated base with knobs and screw fastenings, 75c. each.  
All orders of one dozen or less sent post-paid with instructions.

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## PARTRICK & CARTER,

THE ONLY MANUFACTURERS OF THE ORIGINAL

## GIANT SOUNDER, PERFECTED,

Patented February 16, 1875.

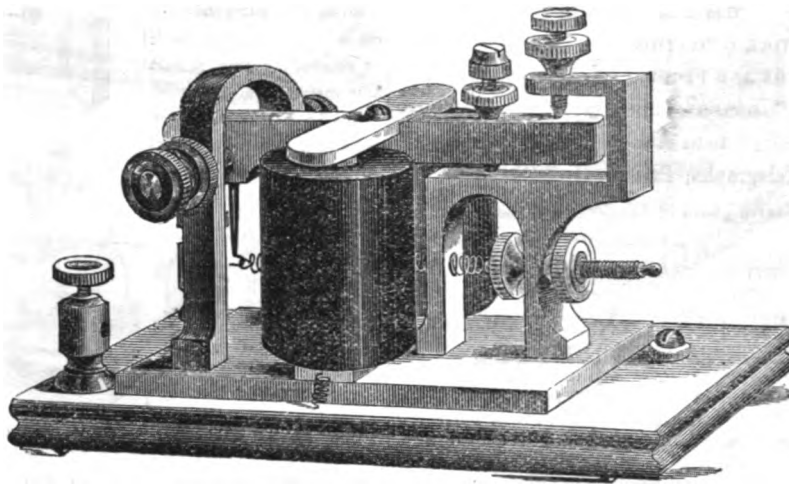
BEWARE OF WORTHLESS IMITATIONS.

OFFICE AND MAGNET WIRE,

BRAIDED AND WOUND, RINGS AND DOVILLS,

WITH COTTON, LINEN, SILK;

Paraffined or Varnished, Compressed and Polished.



MANUFACTURERS OF  
Telegraph Instruments, Batteries, Wire,  
AND SUPPLIES OF ALL KINDS.

The New Giant Sounder possesses many advantages in its tone, sound, working adjustments and general beauty over the old one, and is unapproachably superior to all others of any manufacture whatever. It cannot fail to be adopted whenever it receives a single trial, and is destined to be the Universal Morse Sounder. Every instrument warranted perfect.

**PRICE, sent C.O.D., \$7.50,**

Or 20 per cent. allowed upon receipt of Money Order or Draft in advance.

## CHAMPION LEARNERS' INSTRUMENTS.

THE BEST OUT.

Price of Apparatus complete, with Book of Instructions, Battery Wire, and all necessary materials for one complete office outfit, ready for shipment, \$8.50. Sent by Express, C. O. D.

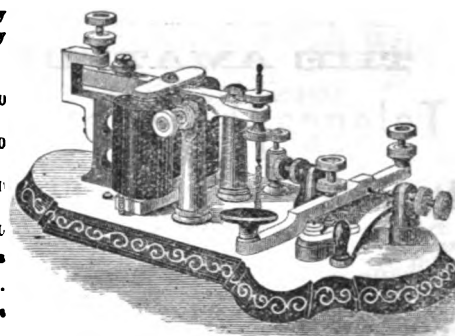
Price of single instrument, good for one mile or less, without Battery, &c. .... \$6 50

Price of single instrument, ornamental, good for one mile or less, covered coils, without Battery, &c. .... 7 50

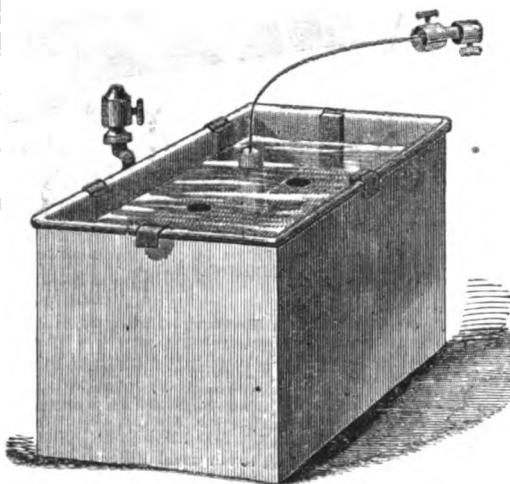
Price of single instrument, good for one to twelve miles, without Battery, &c. .... 7 50

Price of single instrument, ornamental, with rubber covered coils, good for one to twelve miles, without Battery, &c. .... 8 50

This is warranted to be, beyond all comparison, the best Apparatus ever offered for the use of Students of Telegraphy. Twenty per cent. allowed upon above prices upon receipt of Money Order or Draft in advance.



## EAGLE'S METALLIC BATTERY.



THE EAGLE'S METALLIC BATTERY, after two years of trial in every capacity, is now presented with UNQUALIFIED ENDORSEMENTS FROM ALL DIRECTIONS, as being without question the best and most powerful of all constant batteries, and as combining in a remarkable degree, the powerful effects of carbon or other acid batteries, with the constant and enduring capacities of the Callaud, Daniells or other sulphate of copper batteries.

Simple in construction, requiring no skill to set up, nor the least trouble to manage, it does its work with steadiness, economy and DOUBLE THE AMOUNT OF POWER of any sulphate of copper battery, as long as there is left in the jar an ounce of blue vitriol to consume.

When set up properly, it will not foul or give out in from three to twelve months, according to the amount of work required from it, and ALWAYS GIVES UNIFORM STRENGTH OF CURRENT.

For OPEN CIRCUITS, where all other gravity batteries are ACKNOWLEDGED FAILURES, the Eagle's Battery is found to be in every respect A PERFECT SUCCESS.

### PRICES:

No. 1, Square Cell, complete, - - - \$4.25  
No. 2, Round " " - - - 2.00

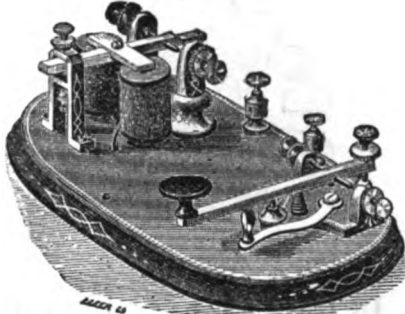
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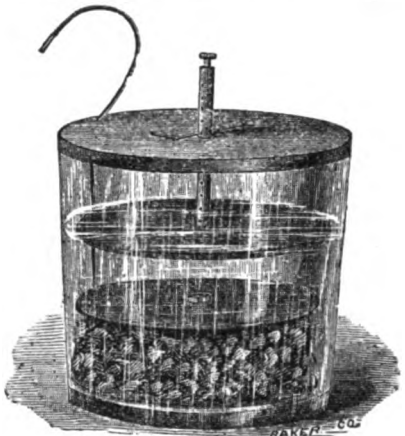


**Western Electric Mfg. Co.,**

220 KINZIE STREET, Chicago, Ill.

**Celebrated  
PRIVATE LINE OUTFIT,  
THE BEST IN THE MARKET.****PRIVATE LINE INSTRUMENT.**

This instrument is mounted on an iron base and finely finished. It gives a clear, loud sound. It is made to work on a line from a few feet to ten miles in length.

**BLISS' RESERVOIR BATTERY.**

This Battery took the First Premium and Silver Medal for force, economy and constancy at the Cincinnati Exposition.

With each "Private Line Outfit" is furnished one Private Line Instrument, one cup of Bliss' Reservoir Battery, the necessary Chemicals, Wire for connections, and a Manual.

**PRICES:**  
PRIVATE LINE OUTFIT, complete, . . . . \$10 00  
INSTRUMENT ONLY, . . . . . 8 00  
BLISS' RESERVOIR BATTERY, per cell, . . . . 2 00

**DISCOUNTS**

A discount of twenty per cent. will be allowed when remittance is made in advance. Remit by express, registered letter, postal order, or draft.

In ordering, state length of line so that the resistance of instruments may be proportioned accordingly.

Send for Circular. Liberal terms to Agents.

**WESTERN ELECTRIC MFG. CO.,  
Chicago, Ill.**

Here It Is.

MANAGERS, OPERATORS, MESSENGERS.

**Sisson's Improved Tidy Fasteners.**

NO FAMILY SHOULD BE WITHOUT IT.

Sells rapidly. Money in it. Send 25 cents for samples.  
Gross, \$7.00. Quarter Gross, \$1.75. Agents wanted.

GEO. W. FLAGG, Newport, R. I.

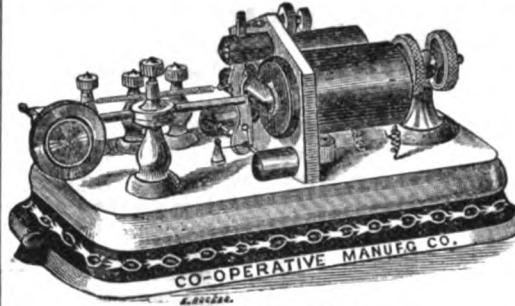
CALIFORNIA AGENCY  
FOR

**Partrick & Carter's Instruments.**

NEW PERFORED GIANT SOUNDERS,  
IMPROVED CURVED KEYS, LATEST AND BEST,  
CHAMPION LEARNERS' INSTRUMENTS,  
SPLENDID NEW POCKET RELAYS, AND  
REGULAR RELAYS.

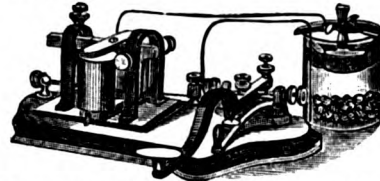
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GEO. M. POMEROY, San Jose, California.

**CO-OPERATIVE MFG. CO., 218 Pear St., Philadelphia.****W. U. Pattern Relay.**

This Relay is acknowledged to be the best in use.  
Is finely finished.

Price, . . . . . \$16.

**Co-operatives' Learners' Instrument No. 1.**

A complete outfit embracing a full-size combined Sounder and Key, mounted on a walnut base, with Battery, Chemicals, Wire and all necessary instructions for setting up and operating them, for practising or communicating purposes, being in all respects a regular Morse instrument, comprised of a first-class Sounder and our improved curved lever Key, made in the best manner and nothing omitted in their construction which could in any way contribute to their efficiency as complete Sounder and Key combined.

The above instrument is nicely finished in brass, and not like other manufacturers' that are made of cast iron.

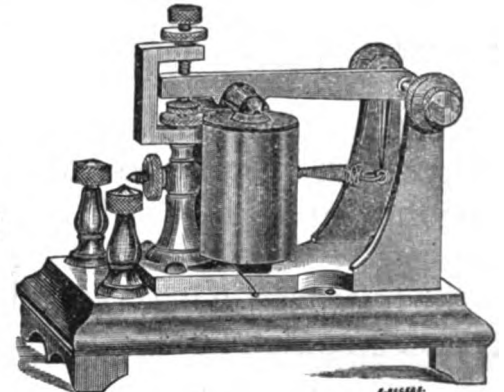
Price of No. 1 Instrument when money is sent  
in advance, . . . . . \$8 00  
With Battery, . . . . . 9 50

When sent C. O. D., . . . . . 8 50  
With Battery, . . . . . 10 00

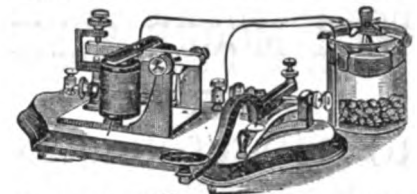
N. B.—Either of the above Instruments can be made to work on a circuit from one to twelve miles by Winding Magnet with fine wire which will make cost of Instrument one dollar extra.

Send for Price List.

**W. R. BALDWIN, Manager, 218 Pear Street, Philadelphia.**

**W. U. PATTERN SOUNDER.**

Price, . . . . . \$7 50

**Co-operatives' Learners' Instrument No. 2,  
THIS BEATS THEM ALL.**

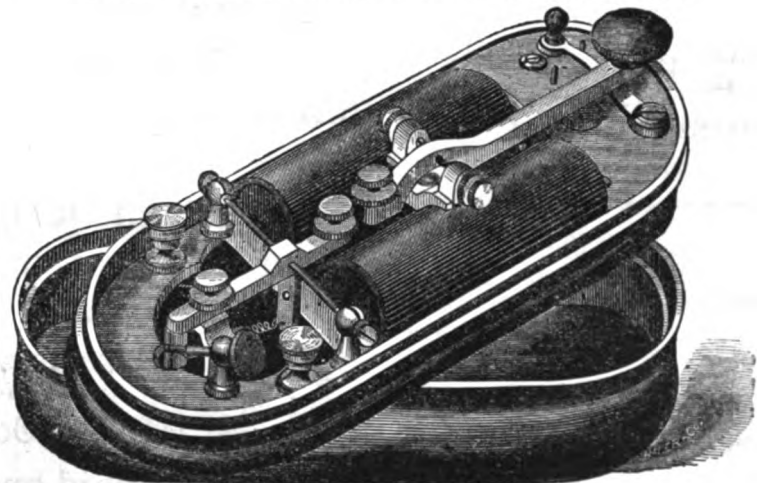
We here present a cut of our No. 2 Learners' Instrument, which is comprised of a full size Key and Sounder. We can safely say this Instrument is far ahead of other manufacturers as to price and quality; it is finished in bronze and mounted on a walnut base.

Price of No. 2 Instrument when money is sent  
in advance, . . . . . \$5 00  
With Battery, . . . . . 6 50

When sent C. O. D., . . . . . 5 50  
With Battery, . . . . . 7 00

**WESTERN ELECTRIC MANF. CO.**

220 Kinzie Street, Chicago, Ill.

**POCKET RELAY,**

PATENTED JULY 13th, 1875.

Our Patent Pocket Relay has an improved key, large enough to be durable and for practical work. It has an independent circuit closer.

The sounding lever is supported by adjustable trunnion screws, and can be readily removed at any time, or adjusted as finely as a relay armature.

The adjustment spring is conveniently arranged, and can be repaired with ease.

The instrument gives a splendid sound.

The case is hard rubber and the same in length and width as the Caton Pocket Relay Case, and a trifle deeper.

It is pronounced the best finished and most serviceable Pocket Instrument made.

**PRICE \$18.00.**

Twenty per cent. discount when money is sent with order.

**WESTERN ELECTRIC MANUFACTURING COMPANY.**

## REFORM IN LIFE INSURANCE.

Cost lessened by dispensing with large accumulations and abolishing Agents' commissions.

Forfeitures abolished. No confiscation of Reserves or Trust Deposits.

Life Insurance stripped of non-essentials and made as plain as Fire Insurance.

## THE PROVIDENT SAVINGS LIFE ASSURANCE SOCIETY OF NEW YORK.

is prepared to issue policies on a new plan approved by the highest authorities, of which the following are the distinguishing features, viz.:

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This plan provides assurance for one year or many years at actual current cost, and at the least cost when assurance is most needed, viz., in the earlier years of the policy.

The Society also issues policies on the usual plan of uniform annual premiums with guaranteed surrender values. Also, non-participating policies. The profits of the stockholders are limited to the last-named class.

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WESTERN UNION BUILDING,  
Corner of Broadway and Dey street.  
CASH CAPITAL, \$125,000.

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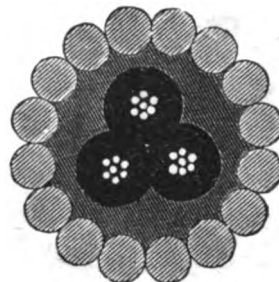
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